MINERALOGICAL ABSTRACTS

(Vol. 4, No. 4, December, 1929.)

Notices of Books.

WAGNER (Percy A.). *The platinum deposits and mines of South Africa.* With a chapter on *The mineragraphy and spectrography of the sulphidic platinum ores of the Bushveld complex* by H. SCHNEIDERHÖHN.[1] Edinburgh & London (Oliver & Boyd), 1929, xv + 326 pp., 38 pls., 37 text-figs. Price 21*s*.

Since the discovery in 1923–4 of the remarkable platinum deposits in the Bushveld, Transvaal, an enormous amount of work has been done in the field and on paper [M.A. **2**–273–4, 440; **3**–44, 75, 137, 397]. As with so many of the mineral deposits of South Africa, the occurrences are of unusual and unexpected types. Platinum metals in association with nickel-iron sulphides are finely disseminated through the norites and dunites of the Bushveld igneous complex over a very wide area. The present excellent book gives a comprehensive account of these deposits, together with an account of other known occurrences in South Africa, including those in the 'Great Dyke' of Southern Rhodesia [M.A. **3**–76, 445]. It is by no means a mere compilation, but contains much original matter, and the author has been acquainted at first hand with all the local conditions and rapid developments. Descriptions are given of the new minerals cooperite, $Pt(As,S)_2$ [M.A. **4**–10, 149] and stibiopalladinite, Pd_3Sb [M.A. **3**–369; **4**–149]. The book is well illustrated and well printed, and it makes a handsome volume, which is a valuable contribution to the literature of platinum. L. J. S.

BRAGG (*Sir* William). *An introduction to crystal analysis.* London (G. Bell & Sons), 1928, vii + 168 pp., 8 pls., 89 text-figs. Price 12*s*.

This work is addressed primarily to those wishing to understand the main principles of a subject in which such progress has been made since Laue's classical experiments. From the pen of one who has done so much to simplify the original methods, an account of

[1] The substance of this chapter by H. Schneiderhöhn also appeared under the title 'Erzmikroskopische und spektrographische Untersuchung von platinführenden Nickelmagnetkiesgesteinen des Bushveld Igneous Complex (Transvaal)' in Chemie der Erde, Jena, 1929, vol. 4, pp. 252–286, 3 pls., 1 text-fig., and in another paper abstracted below [M.A. **4**–149].

the rotating crystal method and an elementary treatment of the theory of space-groups are particularly welcome additions to the literature. It is also shown how many different problems have been helped towards a solution by 'X-ray microscopy', and numerous future applications are foreshadowed. F. A. B.

Milner (Henry B.). *Sedimentary petrography with special reference to petrographic methods of correlation of strata and to subsurface oil geology.* 2nd edition, London (T. Murby & Co.), 1929, xxi + 514 pp., 41 pls., text-figs. Price 21*s*.

This volume is a great improvement on Mr. Milner's book, which was first published as an 'Introduction to Sedimentary Petrography' (1922) [M.A. **2**–3] with a 'Supplement' in 1926. Not only has most of the information contained in both these books been included and rearranged, but there have been made some quite important additions. Of these the most notable are new chapters on the petrography of the consolidated sediments and on the application of sedimentary petrography to the study of soils. In the latter the author has only space to indicate lines along which petrology may help 'pedology'. In the former he makes a very definite contribution to systematic petrography, putting forth a logical classification and describing familiar types of sedimentary rocks in a most concise and methodical manner. Additions of particular interest to mineralogists are an expansion of the details given under diagnostic properties of minerals, and new brief notes on twenty-five minerals which occur sporadically in sedimentary rocks. Among the latter we find the familiar 'basaltic hornblende' all but concealed under the obsolete name of 'basaltine', which included both hornblende and augite. Additions to the bibliography are considerable, and these with the revision to which the whole text has been subjected brings this useful text-book well up to date. The figures, 181 in number, including those in the forty plates, are more than twice as many as those in the two earlier volumes. The printing and paper are good, and the publishers may be congratulated on the new edition. W. C. S.

Rutley (Frank) [1842–1904]. *Elements of mineralogy.* 22nd edit. revised by H. H. Read; introduction by G. T. Holloway. London (T. Murby & Co.), 1929, xxii + 394 pp., 84 figs. Price 6*s*.

This is almost an exact reprint of the twenty-first edition [M.A. **1**–180] with some corrections of statistics of mineral production. The author has revised these statistics, giving the figures for production in

1925 and 1926, but he has evidently been obliged to limit his corrections and additions strictly to the size of his original paragraphs. This leads to difficulties, and one finds, for instance, under 'platinum' South Africa credited with a production of 10,000 ounces in 1926 but not mentioned in the paragraph on 'Occurrence' on the next page. It is odd that sperrylite has never been included in the minerals described in this book, and it is not introduced in the new edition. W. C. S.

Parker (Robert L.). *Kristallzeichnen.* Berlin (Borntraeger), 1929, vi + 112 pp., 35 text-figs., and 50 sheets of blank charts in portfolio. Price 20 Mk.[1]

With the exception of Miss Margaret Reeks's 'Hints on crystal drawing', 1908 [Min. Mag. **15**–269] this appears to be the only book devoted entirely to the methods of drawing crystals. There is, however, no mention of Miss Reeks's book in the short bibliography, nor of the useful chapter in W. J. Lewis's 'Crystallography', 1899. A clear account is given of the various kinds of projections; and the usual methods of finding the intersection of planes from the axial cross and from the stereographic and gnomonic projections are explained in detail. In addition to this, the author develops a new method based on the 'Bildkantenazimute' for drawing crystals in plan and in orthogonal parallel ('O–P') projection. The directions of the crystal-edges or zone-axes are each calculated in terms of the angles (azimuth) from a certain point. These angles can then be plotted directly on the blank charts, which give a circle of 10 cm. radius divided to half degrees. The book concludes with a series of useful tables (34 pp.) giving various relations between face- and zone-indices, and the calculated azimuth angles for drawing cubic crystals and a number (20) of other more common mineral-species. L. J. S.

New Minerals.

Jérèmine[2] (E.), Orcel (J.), & Pied (H.). *Revue des espèces minérales nouvelles.* Bull. Soc. Franç. Min., 1925, vol. 48, pp. 372–379.

Gaubert (P.), Orcel (J.), & Pied (H.). *Revue des espèces minérales nouvelles.* Ibid., 1926, vol. 49, pp. 165–171; 1927, vol. 50, pp. 516–524.

Orcel (J.). *Revue des espèces minérales nouvelles.* Ibid., 1927, vol. 50, pp. 57–60; 1928, vol. 51, pp. 176–180.

[1] Extra copies of the blank charts are supplied at a cost of 8 Mk. per 50.

[2] Printed so in the title; on p. 373 Jérémine and on p. 384 Jerémine.

Orcel (J.). *Revue des espèces minérales nouvelles et comptes rendus de publications étrangères.* Ibid., 1928, vol. 51, pp. 345–354.

Bannister (F. A.). *The so-called 'thermokalite' and the existence of sodium bicarbonate as a mineral* [nahcolite]. Min. Mag., 1929, vol. 22, pp. 53–64.

Tilley (C. E.). *On larnite (calcium orthosilicate, a new mineral) and its associated minerals from the limestone contact-zone of Scawt Hill, Co. Antrim.* Min. Mag., 1929, vol. 22, pp. 77–86, 5 figs.

Marshall (Patrick). *The occurrence of a mineral* [ameletite] *hitherto unrecognized in the phonolites of Dunedin, New Zealand.* Min. Mag., 1929, vol. 22, pp. 174–178, 1 pl.

Finály (I. de) & Koch (Sándor). *Fülöppite, a new Hungarian mineral of the plagionite-semseyite group.* Min. Mag., 1929, vol. 22, pp. 179–184, 4 figs.

Wayland (E. J.) & Spencer (L. J.). *Bismutotantalite, a new mineral, from Uganda.* Min. Mag., 1929, vol. 22, pp. 185–192, 2 figs.

Buttgenbach (H.). *Notes sur la bialite, nouveau minéral, et sur quelques autres minéraux du Katanga.* Ann. Soc. Géol. Belgique, Publ. Congo Belge, 1929, vol. 51 (for 1927–8), pp. c. 117–c. 123, 6 figs. (Reprint 9 pp.)

Bialite occurs as tufts of minute white needles on a compact brown phosphatic rock from Mushishimano, Katanga. The crystals are orthorhombic and flattened parallel to a good cleavage which is also the direction of the optic axial plane. They are optically positive and γ coincides with the length of the needles; β (or α) 1·525, $\gamma < 1{\cdot}546$, $\gamma - \alpha$ 0·02. The mineral is difficultly soluble in acids and contains P_2O_5, Al_2O_3, MgO, CaO, and 27% H_2O. It is perhaps a magnesian variety of tavistockite. Baryte crystals from Changulowe, Kambove, are described. Mispickel from Prince Leopold mine shows the forms *m q n* [Dana] twinned on (103) (rather than on (101)) giving six-sided groups. Cuprite crystals from Katanga show the forms *a o d p* and (410), and are associated with bright distorted crystals *a d n* of native silver. L. J. S.

Chudoba (Karl). *Über „Mangandiaspor" und Manganophyll von Postmasburg (Griqualand-West, Südafrika).* Centr. Min., Abt. A, 1929, pp. 11–18, 2 figs.

A pink to dark-red mineral, previously thought to be rhodonite, in the black manganese ore of Postmasburg [M.A. **3**–396], proves to

be a variety of diaspore containing some manganese. Aggregates of bladed crystals with perfect (010) cleavage up to 8 cm. long occur in bands and nodules in the manganese ore. When heated the mineral becomes opaque and milky but does not decrepitate. It is distinctly pleochroic, α yellowish, γ rose; α 1·7023, β 1·7219, γ 1·7502 (Na). Analysis gave Al_2O_3 78·58, Fe_2O_3 1·96, Mn_2O_3 4·32, CaO trace, SiO_2 0·11, H_2O 14·65 = 99·62, agreeing with $R_2O_3.H_2O$. Sp. gr. 3·328. Associated with this mangandiaspore is a pink mica in scales or columns (2V 0–47°, $\beta = \gamma = 1{\cdot}633$) which was found to contain barium and manganese and is probably manganophyllite.

L. J. S.

Steinwachs (E.). *Buszit, ein neues Mineral der ditrigonal-bipyramidalen Klasse; von Khan in Südwestafrika.* Centr. Min., Abt. A, 1929, pp. 202–205, 1 fig.

This new mineral is represented by a single isolated crystal (12 × 9 mm.) with which some beryl is intergrown. It is yellowish-red with resinous lustre; thin splinters are yellow and transparent. Sp. gr. about 5, H. $5\frac{1}{2}$, n near 1·72, birefringence high. It is of short-prismatic habit with the prism faces vertically striated, and is bounded by a hexagonal prism m $(11\bar{2}0)$, trigonal prism p $(10\bar{1}0)$, ditrigonal prism s $(41\bar{5}0)$, basal pinakoid c (0001), and smaller trigonal bipyramid R $(10\bar{1}1)$; $a : c = 1 : 1{\cdot}1792$, $RR' = 88° 32'$. The material is difficultly soluble and from the absorption spectrum it appears to be a silicate of the rare-earths Nd, Pr, Er, and Eu.

L. J. S.

Schneiderhöhn (H.). *Erzmikroskopische Untersuchung von Cooperit $Pt(AsS)_2$, Stibiopalladinit Pd_3Sb und einem neuen Nickeleisenerz aus den platinführenden Nickelmagnetkiesgesteinen des Bushvelds, Transvaal.*[1] Centr. Min., Abt. A, 1929, pp. 193–202, 2 figs.

These minerals from the platiniferous norites in Transvaal were examined in polarized light on polished sections. Cooperite, $Pt(As,S)_2$ [M.A. **4**–10], is probably orthorhombic and isomorphous with marcasite. Like sperrylite, it is not attacked by aqua regia or by nascent chlorine ($HCl + KClO_3$). Stibiopalladinite, Pd_3Sb, first described by

[1] The substance of this paper is repeated in a special chapter by H. Schneiderhöhn in P. A. Wagner's book 'The platinum deposits and mines of South Africa', 1929 [M.A. **4**–145].

H. R. Adam [M.A. **3**–369] and named by P. A. Wagner [M.A. **4**–145], as minute white grains which when etched with nascent chlorine show a columnar structure and anisotropism. An unknown nickel-iron mineral occurs as minute regular intergrowths in pentlandite and more rarely in chalcopyrite. It shows anisotropism and pleochroism (bright yellow to dark grey) more strongly than any other opaque mineral. Spectroscopic analysis showed the presence of Fe, Ni, some Co, Pd, and traces of Ir, Sb, As, Au, Ag; the mineral is perhaps a ferriferous nickel disulphide. L. J. S.

Zsivny (Viktor). *Klebelsbergit, egy új ásvány Felsőbányáról.* —*Klebelsbergit, ein neues Mineral von Felsőbánya.* [Preliminary communication.] Mat. Természettud. Értesítő, Budapest, 1929, vol. 46, pp. 19–24 (Hung.), pp. 25–26 (Germ. summary), 8 figs.

This occurs as tufts of minute ($\frac{1}{2}$ mm.) sulphur-yellow bladed needles in columnar aggregates of stibnite crystals from Felsőbánya, Hungary [= Baia Sprie, Romania]. The crystals are monoclinic with the forms (010), (001), (110), (101), ($\bar{1}01$); $\beta = 88{\cdot}2°$. The optic axial plane is perpendicular to (010), $Bx_a = a = b, \beta : c = +1{\cdot}8°$, negative, $n > 1{\cdot}74$. The mineral is brittle, fusible, and dissolves slowly in strong hydrochloric acid. Microchemical tests suggest that it is a basic antimony sulphate with little water, Fe, Mg, Na, K, and traces of Bi and P_2O_5. L. J. S.

[Zilbermintz (V. A.)] Silberminz (V.). *Sur le gisement de cérite, de bastnaésite et d'un minéral nouveau, la lessingite, dans le district minier de Kychtym (Oural).*—Зильберминц (В. А.). О месторождении церита, бастназита и нового минерала лессингита в Кыштымском округе (Урал). Докл. Акад. Наук СССР (Compt. Rend. Acad. Sci. URSS), Leningrad, Ser. A., 1929, pp. 55–60, 1 fig. (French).

These minerals together with more abundant orthite in intimate association are found as pebbles in the auriferous alluvials of the Motchaline-log, a tributary of the Borzovka river in the Kyshtymsk district. The occurrence has been traced to the contact-zone of the alkali-syenites. The kischtim-parisite (kischtimite) of T. Korovaev, 1861, from this locality is referred to bastnäsite. Cerite gave the data under I and bastnäsite those under II. Lessingite is cherry-red with bright vitreous lustre on the fresh fracture; analysis III gives the formula $H_2Ca_2Ce_4Si_3O_{15}$. Törnebohmite [M.A. **1**–251], observed

microscopically in thin sections of the cerite, has α 1·85, γ 1·88, 2V 25–40°, positive.

	SiO_2.	Al_2O_3.	Fe_2O_3.	Ce_2O_3.	(Di, $La)_2O_3$.	(Yt, $Er)_2O_3$.	MnO.	MgO.	CaO.	K_2O, Na_2O.
I.	15·60	0·50	0·28	33·65	37·49	0·00	0·15	0·07	1·27	0·15
II.	0·97	0·00	0·00		75·84		n.d.	0·00	0·60	0·00
III.	19·85	0·26	0·65	22·48	36·65	3·42	0·88	0·17	11·71	0·08

	P_2O_5.	F.	CO_2.	H_2O+.	H_2O-.	Total.	Sp. gr.	H.	α.	γ.	2 V.	Opt. sign.
I.	0·00	0·94	7·86	1·29	0·19	99·44	4·896	5½	1·810	1·825	11° to	pos.
II.	trace	2·24	19·55	1·83	0·00	101·03	4·746	4½	1·723	1·825	0°	pos.
III.	1·13	0·54	0·35	1·56	0·38	100·11	4·694	4½	—	1·785	44°	neg.

L. J. S.

Bauer (L. H.) & Berman (Harry). *Mooreite, a new mineral, and fluoborite from Sterling Hill, New Jersey.* Amer. Min., 1929, vol. 14, pp. 165–172.

These two minerals were found with altered pyrochroite, &c., in veins of the calcite-franklinite-willemite ore. Mooreite forms colourless glassy crystals which are monoclinic and tabular on (010), with $a : b : c = 0{\cdot}553 : 1 : 0{\cdot}963$, $\beta = 57° 33'$; optically negative, 2V 50°, $a = b$, $\gamma : c = 44°$, α 1·533, β 1·545, γ 1·547; sp. gr. 2·470; analysis SO_3 10·99, MgO 25·38, MnO 11·93, ZnO 24·58, H_2O 27·12 = 100·00, gives the formula $7R(OH)_2.RSO_4.4H_2O$. With this is a bluish-white mineral called δ-mooreite, which is probably also monoclinic, with 2V 40°, negative, α 1·570, β 1·584, γ 1·585; sp. gr. 2·665; analysis, SO_3 11·64, MgO 17·27, MnO 17·98, ZnO 26·30, H_2O 26·39, B_2O_3 trace, SiO_2 0·08 = 99·66, gives the formula $6R(OH)_2.RSO_4.4H_2O$. Fluoborite forms white fluffy aggregates of fine fibres with ω 1·547, ϵ 1·522; sp. gr. 2·92; analysis, B_2O_3 17·25, MgO 60·07, ZnO 2·41, MnO 1·93, CaO 1·19, F 17·60, H_2O 5·22, CO_2 1·23 = 106·90, agrees with $6MgO.B_2O_3.3(F_2,H_2O)$. L. J. S.

Bauer (L. H.) & Berman (Harry). *Loseyite—a new Franklin mineral.* Amer. Min., 1929, vol. 14, pp. 150–153, 1 fig.

The single specimen of this new mineral from Franklin Furnace, New Jersey, shows radiating bundles of bluish-white lath-shaped crystals in cavities in a narrow vein of pyrochroite, sussexite, &c. Analysis, MnO 34·94, Mn_2O_3 1·03, FeO 0·64, ZnO 32·77, MgO 3·42, CO_2 12·59, H_2O 13·83, SiO_2 0·16 = 99·38, gives the formula $2RCO_3{\cdot}5R(OH)_2$, where R = Mn″ : Zn : Mg = 5 : 4 : 1. The mono-

clinic crystals are elongated parallel to the *b*-axis and show the forms *c* (001), *e* (011), *d* (101), *s* (130), *r* ($\bar{7}$.14.2), *p* ($\bar{1}$36); $a:b:c = 0{\cdot}70:1:0{\cdot}62$. Optically positive, $\beta = b$, a 1·637, β 1·648, γ 1·676, 2V 64°. Sp. gr. 3·27, H. about 3. L. J. S.

Rimann (Eberhard). *Bodenbenderita, nuevo mineral de la Argentina.* Bol. Acad. Nac. Cienc. Córdoba, 1929, vol. 31, pp. 5–17, 1 pl.

Translation of an earlier paper [M.A. **3**–472], adding the results of a spectroscopic analysis of the mineral, showing also the presence of neodymium and praseodymium. L. J. S.

Van Horn (Frank R.). *Suggestions concerning the use of species names in the garnet, amphibole, pyroxene, and tourmaline groups (abstract).* Amer. Min., 1926, vol. 11, pp. 52–54.

A short discussion on the limitations of species and varieties in minerals. Garnet, amphibole, pyroxene, and tourmaline are regarded as group names, like mica and felspar. In the tourmaline group, rubellite, gouverneurite, and pierrepontite (or schorl) are suggested as species names, corresponding respectively with alkali, magnesia, and iron tourmalines. Dekalbite ($CaMg(SiO_3)_2$) and diopside ($Ca(Mg,Fe)(SiO_3)_2$) are species in the pyroxene group, corresponding with tremolite and actinolite in the amphibole group. L. J. S.

Mathematical Crystallography.

Stereographische Projektionsbilder der 32 Kristallklassen. Institut für Mineralogie u. Petrographie d. Univ. Leipzig. Leipzig (M. Jaenecke), [1929], single sheet 64 × 59 cm.

This is based on the arrangement and derivation of the 32 crystal-classes proposed by F. Rinne [M.A. **3**–415, **4**–53]. L. J. S.

Becke (Friedrich). *Inversionsachse und Spiegelachse.* Neues Jahrb. Min., Abt. A, 1928, vol. 57, pp. 173–202, 13 figs.

Niggli (P.). *Das Universalsymmetrieelement.* Ibid., pp. 617–630, 6 figs.

For a complete understanding of the principle of symmetry, it is essential to realize the manifold ways in which a symmetry-group may be described. Rotation-axis, plane, centre, and mirror-axis are well-known concepts. Prof. Becke points out how the inversion-axis, a little-known element of symmetry, may be employed in place of the mirror-axis, with some advantages. Prof. Niggli shows how all symmetry operations may be described as multiple reflections.

Thus reflection in any even number of planes, only the final result of the multiple reflection (in any order) being considered, is identical with the action of a rotation-axis, while reflection in an odd number of planes has the same effect as a mirror-axis or inversion-axis (including the special cases, the plane and centre of symmetry). Thus it is clearly possible to describe any symmetry-group in terms of one or more sets of multiple reflections. M. H. H.

Valeton (J. J. P.). *Ueber die Bedeutung des Symmetrie-Zentrums für die Ableitung und die Systematik der 32 Kristallklassen.* Neues Jahrb. Min., Abt. A, 1928, vol. 57, pp. 763–784, 4 figs.

The 32 crystal-classes may conveniently be deduced and systematically set out by the use of rotation- and inversion-axes and a new conception, a 'universal' axis (U_n), which is at the same time a rotary and an inversion axis. Every class having a universal axis has necessarily a centre of symmetry. The possible combinations of rotary-, inversion-, and universal-axes are worked out, and shown to lead to a simple exposition of the 32 classes. M. H. H.

Giannotti (Carlo). *Sul numero di abiti cristallini teoricamente possibili in base ad un numero* **n** *di forme semplici determinate.* Atti (Mem.) Soc. Toscana Sci. Nat., 1928, vol. 38, pp. 252–266.

Given the number of crystalline forms determined for any given substance a mathematical expression is developed for the number of the habits theoretically possible. Ten such expressions cover the thirty-two symmetry classes. F. A. B.

Gibrat (R.). *Sur les fondements de la cristallographie géometrique.* Bull. Soc. Franç. Min., 1927, vol. 50, pp. 465–480.

A discussion of the fundamental hypotheses of crystallography and the results of the mathematical work of Zaremba and Kreutz [M.A. **2**–105]. F. A. B.

Schubnikow (A.) [= Shubnikov (A.)]. *Über den Effekt beim Aufeinanderlegen zweier regelmässiger Figurensysteme.* Zeits. Krist., 1929, vol. 69, pp. 503–510, 9 figs.

A. Righi (1887) has investigated the pattern which is obtained when one system of parallel lines is placed on the top of a congruent system, the two systems being inclined at a small angle, and the breadth of the lines being comparable with the distance between them. The experiments are extended to cases in which either system

consists of a series of parallelograms, acute angled, isosceles, or equilateral triangles arranged so as to form a rectangular net, which is obtained by a photographic device described in detail. H. H.

Günzburg (A. M.). *Die Grundzüge der Lehre von der Symmetrie auf Linien und in Ebenen.* Zeits. Krist., 1929, vol. 71, pp. 81–94, 38 figs.

An enumeration of the groups of movement in one and two dimensions. H. H.

Motzok (D.). *Substitutionentheorie als Analyse der Symmetrielehre.* Zeits. Krist., 1929, vol. 71, pp. 406–411, 4 figs.

The isomorphism is considered, which exists between permutation-groups and groups of movements leaving one point fixed. H. H.

Kolkmeijer (N. H.). *Einige Bemerkungen über die Millerschen Indizes und das Rechnen mit schiefwinkligen Achsenkreuzen.* Zeits. Krist., 1929, vol. 71, pp. 530–536, 3 figs.

Three elementary geometrical interpretations are given of Miller's indices. Attention is called to the advantage of a simultaneous use of covariant and contravariant components of the direction-vector in dealing with the reckoning of angles for oblique axes. H. H.

Brandenberger (E.). *Systematische Darstellung der kristallstrukturell wichtigen Auswahlregeln tetragonaler Raumsysteme.* Zeits. Krist., 1929, vol. 71, pp. 452–500.

The paper consists of a collection of tables giving the connexion between structure and X-ray reflection for media belonging to the tetragonal system. It is a continuation of previous work [M.A. **4**–52]. H. H.

Haag (F.). *Ein Beitrag zur Geometrie der Netzebene.* Zeits. Krist., 1929, vol. 70, pp. 346–352, 9 figs.

The problem is considered of inscribing inside a given two-dimensional net a net with a mesh of $1/n$ the size; and examples are given of symmetric arrangements of circles touching each other. whose radii are not all equal. H. H.

Haag (F.). *Die Kreispackungen von Niggli.* Zeits. Krist., 1929, vol. 70, pp. 353–366, 12 figs.

A detailed account is given of the 29 methods of arranging circles of given radius so that each circle touches at least three others, and

their centres have a two-dimensional group of symmetry-movements. H. H.

Hermann (C.). *Zur systematischen Strukturtheorie. II. Ableitung der 230 Raumgruppen aus ihren Kennvektoren.* Zeits. Krist., 1928, vol. 69, pp. 226–249, 2 figs.

—— —— *III. Ketten- und Netzgruppen.* Ibid., pp. 250–270.

—— —— *IV. Untergruppen.* Ibid., 1929, vol. 69, pp. 533–555.

The methods of the first paper [M.A. **4**–53] of the series are employed to prove the existence of the 230 crystallographic space-groups, to discuss those groups which have only one or two independent translations, and to find all subgroups of a given type in an assigned space-group, or conversely to find the space-groups in which a given group is contained as subgroup. H. H.

Weber (L.). *Die Symmetrie homogener ebener Punktsysteme.* Zeits. Krist., 1929, vol. 70, pp. 309–327, 63 figs.

The author gives a detailed discussion of the 80 groups of movements with only two independent translations, pointing out that each of nine space-groups has two plane-groups associated with it.

H. H.

Alexander (Ernst) & Herrmann (Karl). *Die 80 zweidimensionalen Raumgruppen.* Zeits. Krist., 1929, vol. 70, pp. 328–345, 26 figs.

—— —— *Berichtigung zu unserer Arbeit „Die 80 zweidimensionalen Raumgruppen".* Ibid., p. 460.

A description of the 80 groups of movements in which the subgroup formed by the translations is generated by two and only two independent translations. H. H.

Alexander (Ernst). *Systematik der eindimensionalen Raumgruppen.* Zeits. Krist., 1929, vol. 70, pp. 367–382, 20 figs.

A description of those groups of movement in which all equivalent points are at the same distance from a fixed line. H. H.

Heesch (H.). *Zur Strukturtheorie der ebenen Symmetriegruppen.* Zeits. Krist., 1929, vol. 71, pp. 95–102.

The author establishes from another point of view the existence of the 80 plane-groups of symmetry which had been found by C. Hermann, L. Weber, and E. Alexander and K .Herrmann [preceding abstracts]. H. H.

Niggli (Paul). *Geometrisches zur Theorie der Kristallschiebungen, Translationen und Zwillingsbildungen.* Zeits. Krist., 1929, vol. 71, pp. 413–451, 15 figs.

The paper deals with the geometrical effect of gliding on the space-lattice of a crystal, with translation considered as a special case of gliding. As illustrations are taken galena, magnetite, and other minerals. H. H.

X-rays and Crystal-structure.

Geller (Adolf). *Ein neues Drehkristallverfahren.* Neues Jahrb. Min., Abt. A, 1928, vol. 57, pp. 945–972, 15 figs.

A modified Weissenberg method is described in which the photographic plate is moved with two different speeds in any one direction or in any two directions with the same speed. In general both the normals to the plate and to the plane of motion of the plate are set perpendicular to the axis of rotation of the crystal. The two photographs then obtained for a rotating crystal are readily interpreted. The method should be particularly successful for crystals with large lattice dimensions. F. A. B.

McKeehan (L. W.). *A method of computation for X-ray diffraction patterns on cylindrical films.* Zeits. Krist., 1929, vol. 70, pp. 515–516.

A convenient method of calculating $\log_{10} \sin \theta$ is given, whose value is required in the analysis of powder photographs on a cylindrical film. H. H.

Walmsley (H. P.). *The constitution and density of particles in precipitated smokes.* Phil. Mag., 1929, ser. 7, vol. 7, pp. 1097-1112.

By striking an electric arc between metal electrodes in air, smokes were produced which yielded X-ray powder photographs. Various metals thus treated give smokes consisting of one or more crystalline oxides; gold and platinum, however, give metallic smokes. Carborundum electrodes give SiO_2 smoke which consists of silica-glass. The densities of the crystalline particles as calculated from the powder photographs are normal. F. A. B.

Mayer (Georg). *Die Gitterkonstante von reinem α-Eisen.* Zeits. Krist., 1929, vol. 70, pp. 383–384.

Very accurate measurements gave $2{\cdot}861_{06\pm3}$ Å. for the lattice constant of pure α-iron. H. H.

Hägg (Gunnar). *Röntgenographische Studien über das System Eisen–Arsen.* Zeits. Krist., 1929, vol. 71, pp. 134–136.

Phases in the alloy Fe-As exist corresponding to the composition Fe_2As and FeAs. An intermediate phase also exists above 795° C. The first phase has a tetragonal unit cell containing two molecules of Fe_2As and having edges given by $a = 3{\cdot}627$, $c = 5{\cdot}973$ Å. The other phase has an orthorhombic unit cell containing four molecules of FeAs, for which $a = 3{\cdot}366$, $b = 6{\cdot}016$, $c = 5{\cdot}428$ Å. H. H.

Ramsdell (L. S.). *An X-ray study of the domeykite group.* Amer. Min., 1929, vol. 14, pp. 188–196, 2 figs.

The X-ray patterns and microscopical examination of polished surfaces of fused mixtures of copper and arsenic confirm the equilibrium diagram that Cu_3As is the only compound and that arsenic (up to 4 %) can be present in solid solution in copper. Whitneyite (Cu_9As) from Michigan is a mixture of algodonite and the Cu-As solution. Algodonite is a definite compound Cu_6As: when heated it breaks down into a mixture of Cu_3As and Cu-As identical with the artificial product; and it cannot be prepared artificially by fusion. Domeykite is also a definite compound Cu_3As, but it gives a different X-ray pattern from that of the artificial Cu_3As: when heated it changes over into a form corresponding with the artificial compound. [Cf. F. Machatschki, M.A. **4**–102.] L. J. S.

Gottfried (C.) & Lubberger (E.). *Die Raumgruppe des Antimonits Sb_2S_3.* Zeits. Krist., 1929, vol. 71, pp. 257–262, 4 figs.

The experiments previously described [M.A. **3**–426] were repeated with more refined apparatus, and stibnite was found to have the space-group V_h^{16} and a unit cell containing four molecules of Sb_2S_3 and having edges of lengths $a = 11{\cdot}39$, $b = 11{\cdot}48$, $c = 3{\cdot}89$ Å. H. H.

Zachariasen (William). *Bemerkungen zu der Arbeit von L. Pauling: The crystal structure of the A-modification of the rare earth sesquioxides.* Zeits. Krist., 1929, vol. 70, pp. 187–189.

The author disagrees with L. Pauling's criticism [M.A. **4**–105] of his work on the crystal structures of La_2O_3, &c., in Zeits. Physikal. Chem., 1926, vol. 123, p. 134. [Cf. M.A. **3**–181.] H. H.

Mizgier (Sophie). *Über die Struktur des Lublinits.* Zeits. Krist., 1929, vol. 70, pp. 160–162.

Debye-Scherrer photographs proved the identity of lublinite and calcite. [The determination was, however, made on museum material,

which having been exposed to temperatures above 5° C. had evidently lost its water of crystallization. See Ann. Rep. Chem. Soc. London, 1928, vol. 24 (for 1927), p. 308.] H. H.

Onorato (Ettore). *Über den Feinbau des Gipses.* Zeits. Krist., 1929, vol. 71, pp. 277–325, 23 figs.

Gypsum has the space-group C_{2h}^3 with unit cell containing eight molecules of $CaSO_4.2H_2O$ and having dimensions given by $a = 10{\cdot}47$, $b = 15{\cdot}15$, $c = 6{\cdot}28$ Å., $\beta = 81° 2'$. H. H.

Ehrenberg (W.) & Hermann (C.). *Die Raumgruppe von Kaliumsulfat.* Zeits. Krist., 1929, vol. 70, pp. 163–170, 3 figs.

Owing to the insufficiency of the data found by other authors it proved advisable to take fresh X-ray photographs of potassium sulphate, by means of which the space-group V_h^{16} was obtained. H. H.

Zachariasen (W. H.). *The crystal structure of potassium chlorate.* Zeits. Krist., 1929, vol. 71, pp. 501–516, 2 figs.

The space-group of potassium chlorate is C_{2h}^2. The unit cell contains two molecules of $KClO_3$ and its dimensions are given by $a = 4{\cdot}647$, $b = 5{\cdot}585$, $c = 7{\cdot}085$ Å., $\beta = 70° 22'$. The parameter values are obtained by two-dimensional Fourier analysis. H. H.

Zachariasen (W. H.). *The crystal structure of sodium chlorate.* Zeits. Krist., 1929, vol. 71, pp. 517–529, 3 figs.

The space-group of sodium chlorate is T^4. The unit cell contains four molecules of $NaClO_3$ and has an edge of length 6·570 Å. The parameter values are obtained by two-dimensional Fourier analysis. H. H.

Goßner (B.) & Mußgnug (F.). *Über Enstatit und sein Verhältnis zur Pyroxen- und Amphibolgruppe.* Zeits. Krist., 1929, vol. 70, pp. 234–248.

Bronzite has a unit cell with edges $a = 8{\cdot}93$, $b = 18{\cdot}2$, $c = 5{\cdot}12$ Å. Hypersthene has the space-group V_h^{16} with unit cell containing 16 molecules and edges $a = 8{\cdot}24$, $b = 18{\cdot}23$, $c = 5{\cdot}20$ Å. The classification of the pyroxene and amphibole groups is considered, the minerals being divided into the subgroups enstatite, bronzite, and hypersthene; monoclinic pyroxenes; triclinic pyroxenes; monoclinic amphiboles including tremolite, hornblende, glaucophane, and rie-

beckite; triclinic amphiboles. The proper classification of the 'orthorhombic hornblendes' is left uncertain. H. H.

Machatschki (Felix). *Untersuchungen über das System BeO-SiO_2.* Zeits. Physikal. Chem., 1928, vol. 133, pp. 253–262.

X-ray powder photographs show that mixtures of beryllium oxide and silica when heated together below the melting-point produce beryllium orthosilicate, artificial phenakite. The crystalline metasilicate cannot be thus produced. Molten phenakite and molten mixtures of BeO and SiO_2 when quickly cooled produce beryllium glass and crystalline BeO. It would appear from considerations of atomic structure that the metasilicate grouping for beryllium is unstable. [M.A. **3**–447.] F. A. B.

Taylor (W. H.) & West (J.). *The structure of norbergite.* Zeits. Krist., 1929, vol. 70, pp. 461–474, 4 figs.

Norbergite, $Mg(F,OH)_2.Mg_2SiO_4$ [M.A. **3**–273], a member of the chondrodite group [M.A. **3**–528], has the space-group V_h^{16} and a unit cell with edges $a = 4{\cdot}70$, $b = 10{\cdot}2$, $c = 8{\cdot}72$ Å. containing four molecules. H. H.

Goßner (B.) & Mußgnug (F.). *Vergleichende röntgenographische Untersuchung von Silikaten.* Zeits. Krist., 1929, vol. 70, pp. 171–184.

Euclase has a space-group C_{2h}^2 with unit cell containing four molecules of $BeSiO_3.AlO_2H$ and having edges $a = 4{\cdot}63$, $b = 14{\cdot}30$, $c = 4{\cdot}71$ Å., $\beta = 79° 44'$. Datolite has a space-group C_{2h}^5 with unit cell containing four molecules of $CaSiO_3.BO_2H$ and having edges $a = 9{\cdot}64$, $b = 7{\cdot}62$, $c = 4{\cdot}82$ Å., $\beta = 89° 51'$. Hemimorphite has a space-group C_{2v}^{20} with unit cell containing four molecules of $ZnSiO_3.Zn(OH)_2$ and having edges $a = 8{\cdot}41$, $b = 5{\cdot}14$, $c = 10{\cdot}73$ Å. H. H.

Náray-Szabó (St.), Taylor (W. H.), & Jackson (W. W.). *The structure of cyanite.* Zeits. Krist., 1929, vol. 71, pp. 117–130, 4 figs.

Kyanite has a unit cell with edges of length 7·09, 7·72, and 5·56 Å. inclined at angles 90° $5\frac{1}{2}'$, 101° 2′, 105° $44\frac{1}{2}'$ and containing four molecules of Al_2SiO_5. The arrangement of the atoms suggested in a previous paper [M.A. **4**–32] is revised in the light of criticism received privately and of the structure found for staurolite. This consists of

alternate slabs of $Fe(OH)_2$ and Al_2SiO_5, and suggests a probable structure for kyanite. H. H.

Taylor (W. H.). *The structure of andalusite, Al_2SiO_5.* Zeits. Krist., 1929, vol. 71, pp. 205–218, 3 figs.

Andalusite has the space-group V_h^{12} and a unit cell containing four molecules of Al_2SiO_5 and with edges given by $a = 7{\cdot}76$, $b = 7{\cdot}90$, $c = 5{\cdot}56$ Å. H. H.

Náray-Szabó (St.). *The structure of staurolite.* Zeits. Krist., 1929, vol. 71, pp. 103–116, 2 figs.

For staurolite is obtained the space-group V_h^{17} and a unit cell containing four molecules with edges given by $a = 7{\cdot}82$, $b = 16{\cdot}52$, $c = 5{\cdot}63$ Å. in agreement with G. M. Cardoso's results [M.A. **3**–529, **4**–111]. This is based on the assumption that the molecule of staurolite is $H_2FeAl_4Si_2O_{12}$, compounded of $Fe(OH)_2$ and $2Al_2SiO_5$ (kyanite). H. H.

Hendricks (Sterling B.). *Diffraction of X-radiation from some crystalline aggregates.* Zeits. Krist., 1929, vol. 71, pp. 269–273, 3 figs.

The X-ray photographs obtained from heated sheets of mica or from natural kaolinite crystals show peculiarities ascribed to the inclination to the cleavage plane of the individuals of which the medium is composed rather than to displacement along the normal to this plane of layers of material parallel to it. H. H.

Mauguin (Ch.). *Etude des micas au moyen des rayons X.* Bull. Soc. Franç. Min., 1928, vol. 51, pp. 285 332, 8 pls., 17 text-figs.

A detailed presentation of work previously published. [M.A. **4**–32–33.] F. A. B.

Burgeni (A.), Halla (F.), & Kratky (O.). *Strukturbestimmung von drei organischen Substanzen.* Zeits. Krist., 1929, vol. 71, pp. 263–268.

d-Tyrosine hydrochloride has the space-group C_2^2 and a unit cell with edges $a = 5{\cdot}03$, $b = 8{\cdot}97$, $c = 22{\cdot}50$ Å., $\beta = 78°\ 32'$ containing four molecules of $OH.C_6H_4.CH_2.CH(NH_2.HCl).COOH$. The tetramethyl ester of methantetracarboxylic acid has the space-group C_{4h}^2 and a unit cell with edges $a = 9{\cdot}12$, $c = 7{\cdot}02$ Å. containing two molecules of $C(COO.CH_3)_4$. Toluene-*o*-sulphonamide has the space-group C_{4h}^6 and a unit cell with edges $a = 18{\cdot}8$, $c = 9{\cdot}15$ Å. containing sixteen molecules of $CH_3.C_6H_4.SO_2NH_2$. H. H.

Knaggs (I. E.). *The space-group of pentaerythritol tetra-acetate.* Zeits. Krist., 1929, vol. 70, pp. 185–186, 2 pls.

Six X-ray photographs are reproduced in order to show that the space-group of penta-erythritol tetra-acetate is C_{4h}^4 and not C_{4h}^3. [M.A. **3**–532, **4**–36, **4**–112.] H. H.

Mark (H.). *Zum Gitter des Diäthylphtalylketons.* Zeits. Krist., 1929, vol. 70, p. 516.

To answer a criticism made by Mrs. K. Lonsdale the author asked Dr. Hengensberg to make a fresh Weissenberg-diagram, and decides that the space-group of diethylphthalylketone is D_{4h}^1 instead of D_{4h}^{10}. H. H.

Hengstenberg (J.) & Mark (H.). *Struktur einiger aromatischer Grundkörper.* Zeits. Krist., 1929, vol. 70, pp. 283–296, 9 figs.

Diphenyl has the space-group C_{2h}^5 with unit cell containing two molecules of $C_{12}H_{10}$ and edges $a = 8{\cdot}22$, $b = 5{\cdot}69$, $c = 9{\cdot}50$ Å., $\beta = 85{\cdot}2°$. Phenanthrene has the space-group C_{2h}^5 with unit cell containing four molecules of $C_{14}H_{10}$ and $a = 8{\cdot}60$, $b = 6{\cdot}11$, $c = 19{\cdot}24$ Å., $\beta = 81° 45'$. Fluorene has the space-group C_{2h}^5 with unit cell containing two molecules of $C_{13}H_{10}$ and $a = 8{\cdot}48$, $b = 5{\cdot}73$, $c = 19{\cdot}24$ Å., $\beta = 78° 7'$. Dibenzyl has the space-group C_{2h}^5 with unit cell containing two molecules of $C_{14}H_{14}$ and $a = 12{\cdot}82$, $b = 6{\cdot}18$, $c = 7{\cdot}74$ Å., $\beta = 64°$. Stilbene has the space-group C_{2h}^5 with unit cell containing four molecules $C_{14}H_{12}$ and $a = 12{\cdot}42$, $b = 5{\cdot}73$, $c = 16{\cdot}0$ Å., $\beta = 66°$. H. H.

Bredig (M. A.) & Möller (H). *Über den Kristallbau der Pikrinsäure.* Zeits. Krist., 1929, vol. 71, pp. 331–343.

Picric acid has the space-group C_{2v}^5 with unit cell containing eight molecules of $C_6H_3N_3O_7$, and with edges given by $a = 9{\cdot}25$, $b = 19{\cdot}08$, $c = 9{\cdot}68$ Å. H. H.

Herrmann (Karl) & Ilge (Wilhelm). *Röntgenographische Strukturuntersuchung von Tetramethylammoniumperchlorat und Tetramethylammoniumpermanganat.* Zeits. Krist., 1929, vol. 71, pp. 47–63, 10 figs.

$(CH_3)_4NClO_4$ and $(CH_3)_4NMnO_4$ are isomorphous tetragonal salts with space-group D_{4h}^7 and unit cell containing two molecules, whose edges are given by $a = 8{\cdot}290$, $c = 6{\cdot}006$, and $a = 8{\cdot}439$, $c = 6{\cdot}019$ Å. for the two substances respectively. H. H.

Chemical Crystallography.

Fajans (K.). *Die Eigenschaften salzartiger Verbindungen und Atombau.* Zeits. Krist., 1925, vol. 61, pp. 18–48, 10 figs.

—— —— *II.* (*Einfluß der Deformation der Elektronenhüllen.*) Ibid., 1928, vol. 66, pp. 321–354, 4 figs.

A theoretical discussion on the relation between the structure of atoms and the optical refraction, crystal-structure, &c., of various substances. L. J. S.

Hantzsch (A.) & Carlsohn (H.). *Bemerkungen zu der Arbeit von K. Fajans: Die Eigenschaften salzartiger Verbindungen und Atombau.* Zeits. Krist., 1929, vol. 69, p. 556.

Fajans (K.). *Antwort auf die Bemerkungen von A. Hantzsch und H. Carlsohn.* Zeits. Krist., 1929, vol. 69, p. 557.

A criticism of K. Fajans's work [preceding abstract] on the colour of HgI, and a reply. H. H.

Gruner (John W.). *Crystal structure types.* Amer. Min., 1929, vol. 14, pp. 173–187, 17 figs.

A general outline is given of types of crystal-structure and their repetition in various compounds, especially with reference to V. M. Goldschmidt's views on variations in atomic radii and co-ordination bonds. L. J. S.

Goldschmidt (V. M.). *Über Atomabstände in Metallen.* Zeits. Physikal. Chem., 1928, vol. 133, pp. 397–419.

The 'atomic radius' is not a constant quantity, but depends on the state of combination of the atom, whether by polar or non-polar valencies, and on the co-ordination number exhibited. In crystals, the co-ordination number of an atom or group is given by the number of equidistant or approximately equidistant neighbours it possesses. The atomic radii of the series of elements Ru–Sb, Os–Bi, and Mn–Ge (except Ga), for the free metal, in crystals with a 12-co-ordinative structure (face-centred cubic or hexagonal close-packed) are determined, directly or by extrapolation from alloys having the desired structure. The same radii appear to hold in intermetallic compounds. For a metal in an 8-co-ordinative crystal (body-centred cubic) the atomic radius is about 3 % less than in the 12-co-ordinative state; in a 6-co-ordinative state, as in SnSb, which

has the NaCl-structure, there is about a 4 % contraction; and in 4-co-ordination (diamond, zinc-blende, wurtzite structures), the contraction is about 12 %. These contractions compare well with those found for similar changes of co-ordination in ionic lattices.

M. H. H.

Pauling (Linus). *The sizes of ions and their influence on the properties of salt-like compounds.* Zeits. Krist., 1928, vol. 67, pp. 377–404, 8 figs.

By the aid of quantum mechanics a simple relation is deduced between the interionic forces in a crystal and the sizes of the ions. The term representing the repulsive force is for practical purposes reduced to the form Born uses (Verh. Deutsch Physik. Gesell., 1919, vol. 21, p. 13). The repulsive exponent, thus calculated, approaches closely the value deduced from the measured compressibilities of the alkali halides. Ionic radii, neglecting deviations from additivity, are thence derived and found to agree closely with the generally accepted values due to Wasastjerna (Soc. Sci. Fenn. Comm. Phys. Math., 1923, vol. 38, p. 1). The well-known deviations from additivity for the alkali halides are shown to depend quantitatively on the radius ratios of the ions. Many physical properties of crystals are also shown to be influenced by this radius ratio. The axial ratios of the rutile-type of crystal and anatase are calculated, and finally the relative stabilities of different crystal structures are discussed. F. A. B.

Wolff (F. von). *Die Kristallstruktur der Elemente und ihre Beziehungen zum periodischen System.* Neues Jahrb. Min., Abt. A, 1928, vol. 57, pp. 265–286, 4 figs.

A survey of the crystal-structures of the elements shows that there is a strong tendency for elements of any one sub-group of the periodic system to possess the same crystal-structure, while the size of the unit cell (and hence the atomic radius) increases with increase of atomic number within one sub-group. The structure is generally different for A and B sub-groups. A table of the interatomic distances is given, including some interpolated values taken from V. M. Goldschmidt's tables, and the compressibilities, specific heats, melting-points, electric and heat conductivities, and magnetic susceptibilities are also tabulated. M. H. H.

Seyfarth (Hellmut). *Strukturfaktor, Auslöschungsgesetz und Molekülzahl der Basis.* (*Ein Satz über Strukturfaktoren.*) Zeits. Krist., 1928, vol. 67, pp. 131–147, 2 figs.

Seyfarth (H.). *Auslöschungsgesetze bei verschiedenartigen Atomen. Gesetzmäßiger Intensitätsverlauf.* Ibid., pp. 422–429.

—— *Zusatz zu meiner Arbeit: Strukturfaktor, Auslöschungsgesetz und Molekülzahl der Basis.* Ibid., pp. 595–596.

A more complete mathematical treatment of how to determine the positions of the atoms of a lattice from the interference of X-rays, without assuming any theory of structure [cf. M.A. **3**–423]. Zirconium silicide ($ZrSi_2$) is cited as an example of the wider range of the method. The author proceeds further by studying the conditions under which lattices made up of different kinds of atoms may be similarly investigated. He applies his results to the case of strontium chloride. From intensity considerations he also considers the grouping of atoms in structures of the cadmium iodide type. F. A. B.

Jung (H.). *Die Konstitutionsformeln der in den Kalisalzlagern vorkommenden Salze vom Standpunkte der Koordinationslehre.* Centr. Min., Abt. A, 1928, pp. 182–185.

Co-ordinative constitutional formulae are given for most of the 'Abraumsalze' in accordance with a rather obsolete form of the Wernerian theory. M. H. H.

Nold (A.). *Über Kristallstruktur. II.* Zeits. Krist., 1929, vol. 69, pp. 427–445, 15 figs. [Cf. M.A. **3**–67.]

A stereochemical consideration of the structure of graphite.

F. A. B.

Niven (C. D.). *Crystal structure of calcium.* Phil. Mag., 1928, ser. 7, vol. 6, pp. 665–666.

Crystals of calcium obtained by distillation have the form of rhombic-dodecahedra, as determined by goniometric measurement.

L. J. S.

Blittersdorf (Helmut). *Optische Untersuchungen am Kaliumlithiumsulfat.* Zeits. Krist., 1929, vol. 71, pp. 141–168, 10 figs.

$KLiSO_4$ crystallizes in the hexagonal system, the ratio of the crystallographic axes $a:c$ being $1:1{\cdot}6755$. The author measured accurately the ordinary and extraordinary indices of refraction for various wave-lengths. The birefringence was also determined for varying temperatures up to the transition-point of the material at about 435° C. H. H.

Ellestad (R. B.) & Gray (F. Anton). *Kristallographische Messungen einiger Doppelnitrate von Neodym und Praseodym.* Zeits. Krist., 1927, vol. 65, pp. 140–141, 1 fig.

The forms (111), (110), (100), $(10\bar{1})$, $(11\bar{1})$ were observed on the trigonal double nitrates of Nd and Pr with Zn, Ni, Mg, Mn, Co. The angles and axial ratios of the ten salts are tabulated. H. H.

Machatschki (Felix). *Über die Kristallgestalt des Magnesiumwolframates.* Zeits. Krist., 1928, vol. 67, pp. 163–165.

Magnesium wolframate ($MgWO_4$) grows in colourless monoclinic crystals of acicular habit with $a:b:c = 0{\cdot}8263:1:0{\cdot}8703$, $\beta = 89° 40'$, isomorphous with hübnerite and wolframite. The plane of symmetry is the optic axial plane. H. H.

Tutton (A. E. H.). *The hexahydrated double sulphates containing thallium.* Proc. Roy. Soc. London, Ser. A, 1928, vol. 118, pp. 367–392, 5 figs.

—— *The hexahydrated double selenates containing thallium. Completion of the thallium salts and of the whole monoclinic series.* Ibid., pp. 393–426, 6 figs.

Accurate measurements were made for the following salts. These complete the author's detailed work on 77 salts of this large isomorphous series [M.A. **2**–102, **3**–161].

	a : b : c	β	$\frac{1}{3}(\alpha+\beta+\gamma)_{Na}$	$2V_{Na}$	Sp. gr.
$Tl_2Mg(SO_4)_2.6H_2O$	0·7442 : 1 : 0·5000	73° 30′	1·5846	74° 57′	3·573
$Tl_2Fe(SO_4)_2.6H_2O$	0·7427 : 1 : 0·4999	73 44	1·6061	69 0	3·650
$Tl_2Mn(SO_4)_2.6H_2O$	0·7454 : 1 : 0·4964	73 38	1·5980	71 26	3·685
$Tl_2Cu(SO_4)_2.6H_2O$	0·7499 : 1 : 0·5033	74 27	1·6094	85 16	3·728
$Tl_2Mg(SeO_4)_2.6H_2O$	0·7485 : 1 : 0·4993	74 24	1·6330	77 33	3·721
$Tl_2Zn(SeO_4)_2.6H_2O$	0·7479 : 1 : 0·5022	76 6	1·6523	68 34	3·958
$Tl_2Ni(SeO_4)_2.6H_2O$	0·7456 : 1 : 0·5019	74 24	1·6479	58 59	3·993
$Tl_2Co(SeO_4)_2.6H_2O$	0·7463 : 1 : 0·5021	74 20	1·6522	66 42	3·998
$Tl_2Fe(SeO_4)_2.6H_2O$	0·7445 : 1 : 0·5011	74 33	1·6485	69 36	3·940
$Tl_2Mn(SeO_4)_2.6H_2O$	0·7463 : 1 : 0·4993	74 31	1·6412	72 27	3·833
$Tl_2Cu(SeO_4)_2.6H_2O$	0·7531 : 1 : 0·5048	75 1	1·6560	85 9	3·944

L. J. S.

Porter (Mary W.). *The refractive indices of cobalt sulphate and of potassium chlorate.* Festschrift Victor Goldschmidt, Heidelberg, 1928, pp. 210–212.

For $CoSO_4.7H_2O$, α 1·4748, β 1·4820, γ 1·4885 (Na); optic axial plane (010), $Bx_a : c = +29° 18'$, 2V 88° 1′, positive. There is a perfect cleavage c(001), and m(110) fair. For $KClO_3$, α 1·4099,

β 1·5174, γ 1·5241 (Na); optic axial plane $\perp$(010), $Bx_a : c = +26° 45'$, 2V 26° 45′, negative. L. J. S.

Porter (Mary W.) *The tetroxalates of the alkali metals potassium, rubidium and caesium, and of ammonium and thallium.* Zeits. Krist., 1927, vol. 66, pp. 217–235, 8 figs.

The authoress makes an exhaustive study of the crystallographic and optical properties of the five tetroxalates with the general formula $RHC_2O_4.H_2C_2O_4.2H_2O$, where R is K, Rb, (NH_4), Cs, or Tl. They all have three good cleavages parallel to (100), (001), and (110), the last being less perfect than the other two. The crystallographic measurements of the triclinic crystals gave:

	a : *b* : *c*.	*α*.	*β*.	*γ*.
K ...	0·6001 : 1 : 0·6643	86° 2′	100° 4′	78° 42′
Rb ...	0·5909 : 1 : 0·6774	85 20	97 43½	79 36
(NH_4) ...	0·6019 : 1 : 0·6865	85 49	97 50	79 43
Cs ...	0·5826 : 1 : 0·6917	85 23	95 13	80 34
Tl ...	0·5854 : 1 : 0·6859	84 58	96 59	80 4

The refractive indices, α, β, γ, and the optic axial angles, 2V, for sodium-light, and the densities are:

	α.	*β*.	*γ*.	2V.	Sp. gr.
K ...	1·4152	1·5364	1·5604	45° 54′	1·860
Rb ...	1·4210	1·5428	1·5595	38 51	2·124
(NH_4) ...	1·4237	1·5500	1·5687	39 55	1·655
Cs ...	1·4365	1·5523	1·5621	30 11	2·352
Tl ...	1·5097	1·6319	1·6538	43 49	2·992

H. H.

Porter (Mary W.). *The ditartrates of the alkali metals potassium, rubidium and caesium and of ammonium and thallium.* Zeits. Krist., 1928, vol. 68, pp. 531–542, 4 figs.

Crystallographic and physical constants of certain ditartrates $(RH.H_4C_4O_6)$ were found to be as in the following table. All the crystals possess one or more well-marked cleavages.

	a : *b* : *c*.	*α*.	*β*.	*γ*.	Sp. gr.
K ...	0·7137 : 1 : 0·7321	1·5105	1·5498	1·5900	1·984
Rb ...	0·6970 : 1 : 0·7237	1·5101	1·5495	1·5833	2·314
(NH_4) ...	0·6911 : 1 : 0·7098	1·5201	1·5611	1·5904	1·673
Cs ...	0·6919 : 1 : 0·6947	1·5206	1·5558	1·5820	2·586
Tl ...	0·6950 : 1 : 0·7234	1·6609	1·6872	1·7046	3·491

H. H.

Steinmetz (H.). *Chemisch-kristallographische Notizen.* Zeits. Krist., 1921, vol. 56, pp. 157–166, 11 figs.

Various substances were re-examined for the purpose of filling gaps in the known data. Details respecting cleavage, etch-figures, optical orientation, &c., are given for: Alanine ($CH_3.CHNH_2.COOH$). Ammonium molybdate ($(NH_4)_5H_7(MoO_4)_6$). Benzidine ($(NH_2)C_6H_4.H_4C_6(NH_2)$) is triclinic, not monoclinic as previously described. Coumarin ($C_9H_6O_2$), the orthorhombic hemimorphism is sometimes obscured by twinning on (010). Acetic acid ($CH_3.COOH$), liquid with a few per cent. of water when cooled from 6° to 0° C. yields thin striated plates with irregular boundaries, which are concluded to be orthorhombic with $a : b = 0{\cdot}69 : 1$. Glycollic acid ($CH_2(OH).COOH$), monoclinic, $a : b : c = 0{\cdot}8473 : 1 : 0{\cdot}7385$, $\beta = 65° 3'$. Haematoxylin ($C_{16}H_{14}O_6.3H_2O$), shown by etch-figures to be monoclinic-sphenoidal. Lupinine nitrate ($C_{10}H_{19}ON.HNO_3$) is tetragonal-dipyramidal (not trapezohedral), but optically biaxial with 2E about 5°. Sodium phosphate ($Na_3PO_4.12H_2O$), trigonal, $a : c = 1 : 0{\cdot}5324$. Hydrogen disodium phosphate ($HNa_2PO_4.12H_2O$), monoclinic crystals of tabular habit with the unusual forms λ (18.5.0) and ξ ($\bar{8}38$). Strychnine nitrate ($C_{21}H_{22}N_2O_2.HNO_3$), monoclinic-sphenoidal, $a : b : c = 1{\cdot}0904 : 1 : 0{\cdot}888$, $\beta = 89° 27'$; in geometrical and optical characters there is an approach to orthorhombic symmetry. Sodium potassium tartrate (Seignette salt, $NaKC_4H_4O_6.4H_2O$). Zinc potassium chloride ($ZnCl_2.2KCl$). L. J. S.

Baier (E.). *Kristallographische und optische Untersuchungen an Dicyanamid.* Zeits. Krist., 1927, vol. 65, p. 719, 1 fig.

Dicyanamide $(CN_2H_2)_2$ forms monoclinic crystals with $a : b : c = 1{\cdot}0021 : 1 : 0{\cdot}4854$, $\beta = 89° 29'$. There is perfect cleavage along (100). The optic axial plane is (010), the mean refractive index is 1·5492; the crystals are optically positive, and have very large dispersion.

H. H.

Maier (Peter). *Die Kristallformen der Bromoseleniate und -telluriate der aliphatischen Amine mit Rücksicht auf ihr Verhältnis zu den entsprechenden Platinaten.* Zeits. Krist., 1921, vol. 56, pp. 241–287, 32 figs.

Detailed crystallographic and optical determinations are given for a series of 35 compounds of the general formula R_2XBr_6 (with occasional chloro-compounds), in which X represents Se, Te, Sn, or Pt,

and R the NH_4 group or a substituted ammonium group (e.g. NH_3CH_3, $NH_2(C_2H_5)_2$, &c.). Certain rules are held to govern the appearance and relative stability of the various polymorphous forms observed; numerous morphotropic relations are discussed in terms of optic axes; and it is pointed out that the elements selenium, tellurium, tin, and platinum are capable of replacing each other isomorphously. L. J. S.

Sabot (R. C.). *Sur les caractères cristallographiques de l'inosito-hexaphosphate de sodium.* Bull. Soc. Franç. Min., 1920, vol. 43, pp. 296–300, 1 fig.

Crystals of the composition $Na_{12}P_6C_6H_6O_{24}.3H_2O + 35H_2O$, prepared from plants and synthesized, are monoclinic, showing the principal pinacoids, (110) and (205), and usually elongated along the axis of symmetry. Measurements with a theodolite-goniometer gave $\beta = 71° 47'$ and $a : b : c = 0{\cdot}630066 : 1 : 0{\cdot}639015$. The optic axial plane is perpendicular to (010), α nearly perpendicular to (001), 2V about 90°, and the birefringence is high. E. D. M.

Vavrinecz (Gábor). *A saccharose kristálytani vizsgálata.* Magyar Chemiai Folyóirat, 1925, vol. 31, pp. 29–32, 33–37, 8 figs.

Vavrinecz (Gabriel). *Kristallographische Untersuchung der Saccharose.* Zeits. Krist., 1926, vol. 64, pp. 543–544. [Abstract.]

A revision of the axial ratios of cane-sugar gave $a : b : c = 1{\cdot}2518 : 1 : 0{\cdot}89458$, $\beta = 77° 4\frac{3}{4}'$. L. J. S.

Terpstra (P.). *Notiz über Brechungsindizes von Kristallen des Pentaerythrit.* Zeits. Krist., 1928, vol. 67, p. 484.

The author points out that the double refraction of penta-erythritol is too strong for the refractive indices given by J. Martin (1888) to be correct, and gives a fresh determination of these indices for four different wave-lengths. H. H.

Ernst (E.). *Über Versuche zur Bestimmung der Kristallklasse des Pentaerythrits.* Zeits. Krist., 1928, vol. 68, pp. 139–151, 15 figs.

The author investigated the habit, etched figures, skeletal growths, and optical properties of penta-erythritol, comparing them with those of potassium ferrocyanide, without finding sufficient data for the determination of the class of symmetry. H. H.

Artificial Minerals.

Tokody (L.). *Über das binäre System Mn_2SiO_4–Ca_2SiO_4.* Zeits. Anorg. Chem., 1928, vol. 169, pp. 51–56, 1 fig.

The melting-points (both liquidus and solidus) and densities of artificial mixed crystals of $(Mn,Ca)_2SiO_4$ were determined, for compositions of 0, 10, 20, 30, 50, and 90 mols. % of Ca_2SiO_4. Tephroite and glaucochroite were readily prepared, and the artificial products agreed closely with the natural in properties. There is uninterrupted mixed crystal formation up to 50 mols. % Ca_2SiO_4 (glaucochroite), and it is stated that the series is uninterrupted between glaucochroite and Ca_2SiO_4, of which the monoclinic γ-form was obtained. [The evidence is not sufficient to justify this statement; the mixture with 90 % Ca_2SiO_4 would, however, appear from the density and microscopic appearance to belong to the monoclinic γ-series.] The densities are stated to fall on a straight line between tephroite and γ-Ca_2SiO_4, but the agreement is not good. [Agreement with a straight line relation between tephroite and the isomorphous β-Ca_2SiO_4 is almost as good, except for the crystals with 90 % Ca_2SiO_4.] M. H. H.

Fricke (R.). *Über das kristallinische Tonerdehydrat v. Bonsdorff's. II.* Zeits. Anorg. Chem., 1929, vol. 179, pp. 287–292.

Whereas a preparation of $Al(OH)_3$ made by the K. J. Bayer process on a laboratory scale was found [M.A. **4**–30] to be bayerite, the product obtained under the conditions used in works practice (higher temperature, stronger alkali, and longer stirring) has now been shown to be gibbsite. X-ray powder data for gibbsite and bayerite are given. M. H. H.

Hüttig (Gustav F.) & Garside (Harry). *Zur Kenntnis des Systems Eisenoxyd–Wasser.* Zeits. Anorg. Chem., 1929, vol. 179, pp. 49–76, 9 figs.

A series of hydrated ferric oxides, prepared from ferric chloride and ammonia solutions and aged and dried under various conditions, and two natural hydrates, goethite and lepidocrocite, have been investigated in respect of their specific heats, isobaric dehydration curves, and three properties involving their chemical activity—catalytic effect on the decomposition of hydrogen peroxide, rate of solution in dilute hydrochloric acid, and rate of reaction with hydrogen sulphide gas. The chemical activity shows a remarkable periodic rise and fall during

ageing. It is concluded that the freshly precipitated material is an amorphous Fe_2O_3-gel. Experiments were made to find how far the precipitates can be dehydrated without loss of chemical activity, and highly active preparations with as little as 1·6 % of water were obtained. The experimental results are discussed in relation to theories on the vapour-pressure and specific heat of gels.

M. H. H.

Nicolardot (P.) & Gaubert (P.). *Produits cristallisés formés dans un verre barytique.* Bull. Soc. Franç. Min., 1928, vol. 51, pp. 333–338, 2 pls.

White, opaque spherulites about 1 cm. in diameter from a barium glass are found to contain three crystalline components. One of these components is probably barium disilicate $BaSi_2O_5$, but the remaining two are certainly poorer in barium content and are not customary products of devitrification. F. A. B.

Slawson (Chester B.). *Note on hydrophilite.* Amer. Min., 1929, vol. 14, pp. 160–161.

Fused calcium chloride (artificial hydrophilite) shows lamellar twinning and is optically biaxial and positive; α 1·600, β 1·605, γ 1·613. It is probably orthorhombic and pseudo-tetragonal. The isotropic modification (?) observed by E. S. Larsen was perhaps a double compound of $CaCl_2$ with the immersion liquids. L. J. S.

Carstens (C. W.) & Kristoffersen (Kr.). *Zur Petrographie einiger Magnesitziegel.* Norsk Geol. Tidsskr., 1928, vol. 10, pp. 1–13, 3 figs.

Magnesite bricks prepared from the serpentine-bearing magnesite of Snarum, Norway, contain periclase (54 %), forsterite (38 %), and a spinel (8 %). A commercial Austrian brick contained much less forsterite and more spinel (magnesioferrite). Bricks prepared from a ferriferous talc-magnesite rock from Alvdal contained periclase (44 %), forsterite and clinoenstatite (together 44 %), a spinel, and some free iron. The mechanical properties of the first two bricks (compressive strength and softening curves) are given. The Snarum brick, being silica-rich, is strongly attacked by basic slags, the Austrian much less so. When fused at 1500° C. and allowed to cool slowly, serpentine gives forsterite and clinoenstatite; talc gives clinoenstatite and a small proportion of silica glass; a mixture of enstatite and magnesia

gives forsterite and periclase or forsterite and clinoenstatite according as the magnesia is in excess or not. M. H. H.

Carstens (C. W.). *Ein Oldhamit-führender Kupferrohstein.* Norsk Geol. Tidsskr., 1928, vol. 10, pp. 39–47, 3 figs.

A raw copper matt (Cu_2S 4·62, CaS 9·07, ZnS 3·55, FeS 81·56 %) prepared by fusing a copper-poor cupriferous pyrites with quicklime consisted principally of troilite, with oldhamite and two other minerals, probably zinc-blende and iron-saturated chalcosine.

M. H. H.

Carstens (C. W.). *Über das Auftreten des Titans in den titanhaltigen Schlacken (mit besonderer Berücksichtigung des Titanmonoxyds).* Zeits. Krist., 1928, vol. 67, pp. 260–278, 6 figs.

Dark-coloured iron-furnace slags and cement clinkers rich in titanium (TiO_2 2–6 %) were examined. In some cases the titanium is present as brown dendritic crystals which appear to be titanium monoxide, TiO, called 'fulvite'. This was prepared by heating rutile and metallic titanium together at 1450°–1500° C. X-ray examination of the brown powder shows it to be cubic with the halite structure and $a = 4{\cdot}235$ Å. In less basic slags the titanium is present partly as titanaugite and partly as 'deoxidized' rutile.

L. J. S.

Angel (Franz). *Über eine besonders schön kristallisierte alpenländische Hochofenschlacke (Melilith-Schefferit-Olivin).* Zeits. Krist., 1928, vol. 68, pp. 157–176, 5 figs.

A well-crystallized blast-furnace slag of unknown origin, but perhaps from Lölling, Carinthia, is described in detail. In a cavity are apple-green crystals of melilite with $a : c = 1 : 1{\cdot}26$. Micro-sections of the mass show melilite, schefferite, and olivine, with some magnetite and glass. The proportions and composition of each of these constituents are calculated from an analysis of the mass; and the slag is compared with rocks of similar composition. L. J. S.

Growth and Corrosion of Crystals.

Spangenberg (K.). *Beiträge zur Erkenntnis des Kristallwachstums.* Neues Jahrb. Min., Abt. A, 1928, vol. 57, pp. 1197–1302, 2 pls., 6 text-figs.

A survey of recent experimental and theoretical work on crystal growth. F. A. B.

Friedel (G.). *Expériences sur la dissolution de formes concaves dans les cristaux.* Bull. Soc. Franç. Min., 1925, vol. 48, pp. 6–11, 1 pl.

Circulation of nearly saturated alum solution in a cylindrical cavity of an alum crystal produces the cube, octahedral and rhombic-dodecahedral faces; the slow solution of a concave surface is exactly the same as the slow growth of a convex surface in the forms each produces. It is noted, without explanation, that inclusions having the form of negative crystals previously invisible make their appearance during the passage of water or alum solution through the cylindrical cavity. These are due to solution, yet under the microscope no channels appear between the inclusions and the cavity.

F. A. B.

Friedel (G.). *Sur la croissance et la décroissance des cristaux dans une solution.* Bull. Soc. Franç. Min., 1925, vol. 48, pp. 12–69, 21 figs.

—— *Sur la croissance et la décroissance des cristaux.* (2e note.) Ibid., 1926, vol. 49, pp. 87–108, 4 figs.

—— *Sur la croissance et la décroissance des cristaux.* (Note rectificative.) Ibid., 1927, vol. 50, p. 464.

The author generalizes the Valeton expression for crystal growth [M.A. **2**–326, **3**–330] and shows how the growth is affected by diffusion at crystal edges and corners. He thence discusses the precise factors influencing the development of plane or curved faces; alum, diamond, and rock-salt crystals are cited as examples. In the second note, the heat of crystallization is taken into account, this being of importance in fusions.

F. A. B.

Schubnikow (A.) [= Shubnikov (A.)] & Lämmlein (G.). *Die Kristallisation auf der Oberfläche der Schmelze.* Zeits. Krist., 1928, vol. 67, pp. 329–338, 11 figs.

Further observations on the crystallization of supercooled salol [M.A. **3**–329].

L. J. S.

Schubnikow (A.) [= Shubnikov (A.)]. *Ein neuer Kristallzüchtungsapparat.* Zeits. Krist., 1929, vol. 69, pp. 516–518, 2 figs.

A description is given of a new apparatus for growing crystals, which ensures the constancy of the temperature and the freedom of the solution from inoculation by crystalline particles from the air.

H. H.

Ernst (E.). *Zum Problem des Kristallabbaues durch Aetzung.* Neues Jahrb. Min., Abt. A, 1928, vol. 56, pp. 499–528, 1 pl., 15 text-figs.

The corrosion of crystals by etching is considered theoretically in connexion with the rate of shift of certain faces on the crystal, the term 'Verschiebungsgeschwindigkeiten (V. G.)' including both the rates of solution and of growth ('Lösungs- und Wachstumsgeschwindigkeiten'). Owing to the development of etch-hills on certain faces the rates of solution on the vicinal faces forming these hills come into play in addition to the actual rate of solution on the plane itself. The deeply corroded crystals of gem beryl from Brazil, illustrated by good sketches, are given as an example. L. J. S.

Herlinger (E.). *Über Vektoren zur Trachtbeschreibung.* Min. Petr. Mitt. (Tschermak), 1928, vol. 39, pp. 304–315, 14 figs.

An application of vectors to the description of crystal habit. The photogoniometer can be used to measure the quantities involved and at the same time can be adapted to determine the fine structure of the crystal. F. A. B.

Neuhaus (Alfred). *Messungen von geometrischen Verschiebungsgeschwindigkeiten am NaCl und deren Abhängigkeit von Begrenzungsart, Konzentration und Lösungsgenossen.* Zeits. Krist., 1928, vol. 68, pp. 15–81, 2 pls., 1 text-fig.

Precise measurements were made on the rate of growth of spherical and other bodies of halite immersed in weak supersaturated sodium chloride solution. In every case the rate of growth of the forms (100), (111), (210), (110) is in ascending order of magnitude. Experiments were also made on the rate of growth in solutions of sodium chloride containing urea, and of the rate of solution in the absence of urea. The apparatus used was that employed by Gille and Spangenberg [M.A. **3**–330], in which a stirred solution is kept in a closed thermostat, and slow evaporation produced by passing over it a current of air free from moisture and dust. H. H.

Schnorr (Walter) [–1924]. *Über das Wachstum von Auflösungskörpern und von Kugeln aus Steinsalz.* Zeits. Krist., 1928, vol. 68, pp. 1–14, 5 figs.

Spheres of halite or crystals subjected to partial solution were placed in supersaturated solutions of sodium chloride, either stirred or left undisturbed, and it was found that the nature of the growth

was independent of the original shape, the body finally approaching the cubic form. Similar experiments were made with solutions whose composition approximated to that of sea-water. H. H.

Groß (R.) & Nehmitz (A.). *Über Bildung von Subindividuen.* Zeits. Krist., 1928, vol. 67, pp. 409–421, 8 figs.

Experiments on the velocity of growth on a face of a rock-salt cleavage cube in a supersaturated salt solution show that the age of the solution is an important factor. The number of nuclei formed after a given time in a fresh, slightly supersaturated solution was counted and it is found that their rate of formation over several hours is approximately constant. These investigations show that this growth by addition of nuclei, an aspect hitherto not considered, is of considerable importance in considerations of crystal growth. It appears that accelerated or arrested growth influence different crystal forms in different ways and hence can change their habit. The effect of adsorption of foreign bodies remains unexplained. It is thought that the factor of nuclear formation can be applied when considering the genesis of minerals. F. A. B.

Bernauer (F.). *Ueber das Verhalten von Gasblasen an der Oberfläche wachsender Kristalle, insbesondere die dabei u. U. eintretende Beschleunigung der Kristallisation.* Neues Jahrb. Min., Abt. A, 1928, vol. 57, pp. 1131–1148, 17 figs.

A study of the behaviour of gas bubbles during the crystallization of a fused substance or a concentrated solution on a microscope slide and under a cover-slip, and of the effects on the crystallization of the substance. A large variety of organic compounds were employed, and practically every possible behaviour was observed, including inhibition of crystallization, indifference, accelerated growth of the original crystal at the point where it meets the bubble, and action of the bubble as a centre of fresh crystallization. M. H. H.

Royer (L.). *Recherches expérimentales sur l'épitaxie ou orientation mutuelle des cristaux d'espèces différentes.* Bull. Soc. Franç. Min., 1928, vol. 51, pp. 7–159, 4 pls., 20 text-figs.

A detailed investigation of parallel growth is attempted in the light of knowledge of the cell dimensions and structure of crystalline substances. X-ray methods are used in this study, but the chief method is to determine the refractive index of the crystal deposited by the immersion method. Many new cases of parallel growth are

cited, notably NH_4Cl and NH_4Br on rock-salt, sylvine, and galena, which cases show that 'épitaxie' is possible when the reticular distances are approximately identical only in two dimensions and not in three. The investigation of parallel growths of NH_4I on mica yields evidence as to the existence of a glide plane of symmetry in the latter. The author has also proved that parallel growths of anhydrous NaBr unstable at ordinary temperatures are deposited on galena. Parallel growth depends on two or possibly three factors: (*a*) The reticular distances must be approximately equal or a simple multiple of one another in the plane of contact. (*b*) Ions of the new space-lattice taking the place of the ions of the 'cristal porteur' must have the same sign. (*c*) Parallel growth does not occur between substances differently bonded, i. e. between molecular and ionic crystals. Well-known cases of parallel growth between minerals are found to be in accordance with these laws. F. A. B.

Chudoba (Karl). *Über Streifung und Riefung der Kristalle.* Festschrift Victor Goldschmidt, Heidelberg, 1928, pp. 81–84.

The author draws a distinction between the striations formed by the oscillation between two faces, as in pyrite, and the striations formed by the contributions of a large number of faces in one zone, e. g. topaz. Striations are important indications of the principle zones of growth. Some attempt is made to connect the presence of striations with the presence of impurities and more particularly with the paragenesis of the mineral. F. A. B.

Seebach (M.). *Über Ätz- und Lösungserscheinungen am Korund.* Neues Jahrb. Min., Abt. A, 1926, vol. 54, pp. 420–443, 21 figs.

A small polished sphere of artificial corundum was heated in potassium bisulphate for various lengths of time. The measurements of the light-figures accompanying the morphological changes of the sphere were observed with a two-circle goniometer, and the results are plotted on a gnomonic projection together with the forms observed on natural crystals. The shape finally assumed by the sphere, after prolonged action of the solvent, is conditioned by the directions of greatest solution velocity and is a combination of the scalenohedron $(41\bar{5}4)$ and rhombohedral forms. The edges of this final body correspond to the important zones of growth, namely $[(0001) : (10\bar{1}0)]$, $[(0001) : (11\bar{2}0)]$, and $[(10\bar{1}0) : (11\bar{2}0)]$. That corundum belongs to the ditrigonal-scalenohedral class of the rhombohedral system is shown by the form finally taken by the etched sphere. F. A. B.

Himmel (Hans). *Gips von Wiesloch (Baden).* Centr. Min., Abt. A, 1927, pp. 342–349, 6 figs.

Clear crystals (*b m l*) of gypsum up to 10 cm. long are abundant in Middle Oligocene clay in the clay pits near Wiesloch. They are associated with small concretions of pyrite, which is largely altered to limonite, and were probably formed soon after the sedimentation of the clay. Near the surface the crystals are corroded, but at depths greater than 50 cm. they show growth forms on the faces. These growth and solution forms are figured. L. J. S.

Korinth (Erich). *Diffusionsringe und Kristallisationshöfe.* Inaug.-Diss., Jena, 1928, 28 pp., 4 pls., 2 text-figs.

Linck (G.) & Korinth (E.). *Über Diffusionsringe und Kristallisationshöfe.* Zeits. Anorg. Chem. 1928, vol. 171, pp. 312–316, 1 fig.

The behaviour of sulphur crystallizing from solution in carbon disulphide mixed with benzonitrile is described. Haloes were developed around the growing crystals in the presence of thickening agents such as caoutchouc. By the addition of nitrobenzol, tetragonal crystals (probably of sulphur) were obtained; $a : c = 1 : 0{\cdot}46801$ (measured in the microscope), optically positive, birefringence low, about 0·005. These passed over into liquid drops on standing. Some measurements are given for the two monoclinic forms. Experiments were made on ring formation by the reaction of gaseous HCl or HBr with NH_3; rings were only formed when the tube was illuminated or shaken. A. F. H.

Linck (G.). *Über Diffusionsringe.* Chemie der Erde, 1928, vol. 4, pp. 88–94, 2 figs.

Experiments were made on microscope slides of the diffusion of drops of silver nitrate and potassium chromate solutions in gelatin. These solutions, as well as that of the resulting potassium nitrate, show different rates of diffusion. Potassium nitrate separates out as minute crystals when the diffusing solution periodically reaches a state of supersaturation. Silver chromate separates out as amorphous globules, and here there is a rhythmic precipitation depending on the coagulation of the sol. L. J. S.

Dittler (E.). *Bemerkungen über die Diffusion in Schichtkristallen.* Zeits. Anorg. Chem., 1928, vol. 168, pp. 309–312.

Whereas diffusion in the solid state becomes appreciable for isomorphous metals at a temperature considerably removed from the

melting-point, it is much less marked in non-metallic crystals. The examination of a collection of zoned crystals prepared by C. v. Hauer about 50 years ago and consisting of a coloured nucleus and a colourless or less strongly coloured shell confirms this. In a few instances only had the boundary between the layers lost its sharpness; these exceptions are attributed to the presence of included mother-liquor, causing diffusion by solution and recrystallization. One crystal was observed, the nucleus of which had effloresced, apparently losing water through the intact shell. M. H. H.

Tubandt (C.), Reinhold (Herm.), & Jost (Wilh.). *Diffusion in kristallisierten Verbindungen.* Zeits. Anorg. Chem., 1928, vol. 177, pp. 253–285.

When two pastilles or crystal plates of electrolytically conductive crystalline salts, both of which are anodic or both cathodic conductors, are clamped together with two smooth surfaces in contact, diffusion takes place by ionic interchange without the contact surface becoming roughened or altered or the plates fused together. This fact has been employed for the quantitative study of the diffusion. Provided the weights of the ions involved in the interchange are sufficiently different, the process can be followed by merely weighing the plates or pastilles before and after diffusion. The method has been applied to determine the equilibrium point in suitable systems, such as that between the mixed crystals $(Cu,Ag)_2S$ and (Cu,Ag)I. By commencing with two pastilles, one of a pure salt, the other of a mixed crystal of the same salt with about 5 % of an 'indicator' salt having the same non-mobile ion, the speed of migration of the latter can be determined. As the results with different indicators in the same solvent salt are nearly the same, provided the concentration of indicator is low, the velocity found is taken to be that for the 'self-diffusion' of the pure salt. The variation of the diffusion constant with temperature was followed, and it is shown that the experimental values agree well with the values calculated from the conductivity. M. H. H.

Straumanis (M.). *Uber* [sic] *die Verteilung von Beimengungen in Zinkeinkristallen.* Zeits. Anorg. Chem., 1929, vol. 180, pp. 1–10, 2 pls., 5 text-figs.

When a single crystal is prepared from zinc containing small additions of cadmium or other metals not miscible with zinc in the

solid state, the impurities do not become concentrated in the last part of the melt to solidify, but separate in regularly distributed layers parallel to the basal plane of the zinc crystal (which grows with a (1010) face perpendicular to the direction of growth). An explanation is suggested. The phenomenon was observed with zinc containing 0·2 % of cadmium, and with ordinary 'pure' zinc (Kahlbaum) (cf. Rosbaud & Schmid, Zeits. Physik, 1925, vol. 32, p. 197) but not with a vacuum-distilled zinc. M. H. H.

Topographical Mineralogy.

Catalogue of plans of abandoned mines. Mines Department, London, 1928, vol. 1, iii + 414 pp., price 15*s.*; 1929, vol. 2, iii + 463 pp., price 15*s.*

This gives a very complete and useful list of old mines, both coal and metalliferous, in England. The name, parish, precise location, and minerals formerly worked are stated for each. The value of the catalogue has been much increased by listing also many mines for which plans of the workings have not been found. The chapters dealing with each county are separately paged, ranging from 2 pages for Dorset and Kent to 160 pp. for Cornwall and 191 pp. for Staffordshire. Vol. 1 includes Cheshire, Cumberland, Durham, Lancashire, Northumberland, Westmorland, Isle of Man, and vol. 2 Cornwall, Devon, Dorset, Gloucester, Kent, Somerset, Stafford, Worcester. L. J. S.

Smythe (J. A.). *Minerals of the north country. Miscellaneous.* The Vasculum, Newcastle-upon-Tyne, 1927, vol. 14, pp. 12–17.

Notes on quartz, barytes, anhydrite, &c., from various localities in the north of England, with a short index to the previous papers of this series [M.A. **3**–24, **3**–350]. L. J. S.

Palache (Charles). *A comparison of the ore deposits of Långban, Sweden, with those of Franklin, New Jersey.* Amer. Min., 1929, vol. 14, pp. 43–47, 1 pl.

A review is given of a paper by N. H. Magnusson (Geol. För. Förh., 1924) on the minerals of Långban from a geological point of view, and his table of their paragenesis is reproduced. In contrast with the abundance of zinc ores at Franklin Furnace, these are entirely absent at Långban. Both localities have yielded many unusual types

of minerals, but really few of them are common to both deposits, these being manganese silicates, oxides, and arsenates, and lead silicates. L. J. S.

Pacák (Oldřich). *Příspěvek k mineralogické topografii pražského okolí.* [Contribution to the mineralogical topography of the environs of Praha.] Časopis Národního Musea, Praha, 1928, vol. 102, pp. 148–158.

At Nové Strašmice, gypsum crystals *b m* ($6 \times 4\frac{1}{2}$ cm.) and destinezite concretions occur in Ordovician slates as the products of decomposition of pyrite. At Konvářka, near Radlice, minute acicular crystals (0·001–0·002 mm.) of calcite of the 'lublinite' habit were found in a cavity in Upper Silurian graptolitic slates; they have an extinction-angle of 37–46°, and are elongated in the direction of a rhombohedral edge. At the same locality lamellar and fibrous aggregates of gypsum fill spaces between the bedding planes. At Barrandov, concretions of pyrite and crystals *p z m* of smoky-quartz occur in Devonian limestones. F. S.

Sotorník (Vladimír). *Nerosty alpské paragenese z Práchovny u Kutné Hory.* [Minerals of alpine paragenesis from Práchovna near Kutná Hora.] With goniometric data by the late Prof. Vrba. Rozpravy České Akad., Class 2, 1928, vol. 37, no. 38, 16 pp., 6 figs. French résumé in Bull. Intern. Acad. Tchèque Sci., 1928, vol. —, pp. —.

K. Vrba [1845–1922] published in 1901 a short note on the quarry at Práchovna giving a list of the minerals found there and enumerating their crystal-forms (Věstník of the third Congress of Czech Naturalists). The present author has recently given an account of the chemical characters of the gneisses at this locality and of their metamorphism (sericitization) in connexion with the mineral veins (Rozpr. České Akad., 1928, vol. 37, no. 18). He now gives a detailed description of the several minerals, which form an assemblage analogous to that of the alpine mineral veins. The following is the order in which the different minerals commenced to crystallize, and there is overlapping in their periods of growth: quartz, adularia, tourmaline, anatase, muscovite, fluorite, chlorite, calcite, brookite, blende, pyrite. The gneiss penetrated by these mineral-bearing fissures is as a rule quite unaltered. A genetic connexion with the neighbouring metalliferous veins of Kutná Hora is very probable. F. S.

Iancoulesco (Aurel P.). *Les richesses minières de la nouvelle Roumanie.* Paris (J. Gamber), 1928, 380 pp., 1 fig. Price [10*s.* 6*d.*].

This general account of the mineral resources of Romania deals largely with oil, coal, and gas; and other deposits formerly belonging to Hungary are briefly mentioned. The conditions and the mining laws are stated. L. J. S.

Krümmer (Adolf). *Die türkischen Bodenschätze.* Archiv f. Lagerstättenforschung, 1928, no. 37, 17 pp., 2 pls. (maps).

Brief particulars are given of the deposits of various economic minerals in Asia Minor (Anatolia) that were worked or examined by the Germans during the war. L. J. S.

Wray (D. A.). *Greece: its geology and mineral resources.* Mining Mag. London, 1929, vol. 40, pp. 9–17, 85–90, 149–153, 13 figs.

A brief outline of the geology is followed by a more detailed general account of the mineral deposits. The more important minerals now worked include magnesite and emery and ores of Pb, Zn, Cr, Fe, Mn; others mentioned are ores of Au, Sb, As, Ni, marble and other building materials, coal, lignite, and oil. L. J. S.

[Fersman (A. E.)] Ферсман (А. Е.). Хибинские и Ловозерские тундры. Том. I. Маршруты.—[English summary, pp. 187–188:] Fersman (A. E.). *The Khibine and Lovozero tundras* (*Umptek and Luyavrurt*). *Part I. Routes.* Научно-Техн. Отдел В.С.Н.Х. no. 106 = Труды Научно-Исслед. Инст. изуч. Севера, no. 29 (Sci.-Techn. Dept. Supreme Council of National Economy, no. 106 = Trans. Inst. Sci. Exploration of the North, no. 29), Moscow, 1925, 197 pp., 2 maps, 3 pls., 16 text-figs.

—— Том II. Физико-географический очерк, петрография, месторождения.—[English summary, pp. 381–386:] *Part II. Physico-geographical description, petrography, layers* [i.e. mineral deposits]. Ibid., no. 223 (no. 39). Moscow, 1928, 398 pp., 1 map, 7 pls., 28 text-figs.

—— *Geological map of the Khibine tundras.* [Reprinted from part II above.] Moscow, 1929, 6 pp., 1 map.

This is a collected account of the expeditions during 1920–26 for the investigation of the large massifs of alkali rocks in the centre of the Kola Peninsula, on which many preliminary papers have been published [M.A. **3**–235, &c.]. L. J. S.

Tschirwinsky (P.) [= Chirvinsky (P. N.)]. *Beiträge zur Mineralogie Rußlands. III. Teil. Calciumphosphate, Phosphorit, Apatit, Pyromorphit, Datolith, Axinit, Epidot, Granat, Vesuvian, Gehlenit, Chloritoid, Delessit, Hisingerit, Halloysit, Aktinolith-Asbest, Feldspate, Zeolithe (Analcim, Natrolith, Mesolith, Apophyllit, Heulandit, Ptilolith, Desmin, Laumontit, Leonhardit), problematisches Mineral.* Zeits. Krist., 1929, vol. 70, pp. 249–282. [Cf. M.A. **3**–125, 443.]

Collected notes on these minerals from various localities in South Russia, with several chemical analyses. The zeolites are from Kara-Dagh, Crimea. L. J. S.

Smith (Warren D.). *Geology and mineral resources of the Philippine Islands.* Manila (Bureau of Printing), 1924, 559 pp., 40 pls., 22 text-figs. [Price 14*s.*]

A general account is given of the geography, geology, petrography, volcanology, economic geology, &c., with further details on the regional geology under each island. A chapter on mineralogy (pp. 333–350) gives an alphabetical list of minerals known from the Philippine Islands. [See M.A. **3**–541.] L. J. S.

Maufe (H. B.). *Report of the Director for the year 1927.* Geol. Survey Southern Rhodesia, Salisbury, 1928, 18 pp. [Cf. M.A. **3**–28, 445.]

Contains brief references to the various minerals, especially: asbestos (Shabani); gold, copper ores (Hartley); gold, galena, barytes, antimonite (Gwelo); gold, copper ores, bixbyite, vanadinite (Lomagundi); cassiterite (Mazoe); stibiotantalite (Charter). S. J. S.

Keep (F. E.). *The geology of the Shabani mineral belt, Belingwe district.* Southern Rhodesia, Geol. Survey Bull., 1929, no. 12, 193 pp., 19 pls., 14 text-figs.

Shabani North township lies about 100 miles east of Buluwayo; the area described in this memoir is around and south-west of the township. The Basement Schists underlie more than half of the area, forming a belt within the granite bathylith of the Lundi Native Reserve. The rocks are mostly banded ironstones, jaspilites, quartzites, and amygdaloidal greenstones, which are changed locally into chlorite- and talc-schists. These rocks are invaded by an ultrabasic serpentine complex and a younger series of gneissic granites. The valuable mineral deposits are veins of chrysotile asbestos, within

the dunite-serpentine, and gold-quartz reefs in the contact-zone between granite and schists. 52 pages are given to the petrography of the schists and the intrusive igneous rocks, 15 to a discussion of the origin of serpentine and the process of serpentinization, 11 to the origin of chrysotile seams, and 8 to the origin of slip-fibre asbestos. The value of these sections is enhanced by a score of new chemical analyses by E. Golding. The remainder of the book is devoted to the description of individual mines and claims. To the end of 1927 the output of asbestos has been 130,446 tons. S. J. S.

Teale (E. O.). *Tanganyika Territory: its geology and mineral resources.* Mining Mag., London, 1928, vol. 38, pp. 331–338, 8 figs.; 1928, vol. 39, pp. 9–17, 75–82, 15 figs.

A useful outline by the Director of the Geological Survey, with geological sketch-map. Much of the area is occupied by crystalline schists, granite, and lava. Minerals that have been profitably worked are gold, mica, diamond, salt, garnet, and red-ochre; and many others have been recorded. Diamond occurs at Mabuki, 35 miles SSE. of Mwanza, in a kimberlite pipe penetrating granite and in the overlying gravels. The yield in 1927 was 18,766¼ carats. Associated minerals are garnet, diopside, clinoenstatite, and ilmenite. Gem garnet is found at Namaputa in the Lindi district. L. J. S.

Palache (Charles). *Mineralogical notes on Franklin and Sterling Hill, New Jersey.* Amer. Min., 1928, vol. 13, pp. 297–329, 7 pls.

Collects together a long series of valuable notes, including several new chemical analyses, crystallographic and optical constants, new crystal-forms, modes of occurrence, &c., recently determined for the following species. Chessylite, bornite, cahnite, clinohedrite, clinozoisite, crocidolite, gageite, glaucochroite, hetaerolite, hodgkinsonite, leucophoenicite, manganite, quartz, smithsonite, sussexite, tephroite, tennantite, and willemite. The list of minerals from Franklin Furnace and the neighbouring Sterling Hill now numbers 128 species. L. J. S.

Palache (Charles). *Paragenetic classification of the minerals of Franklin, New Jersey.* Amer. Min., 1929, vol. 14, pp. 1–18, 1 pl.

A list is given of 137 mineral-species that have been found in the district around Franklin Furnace, the majority of which are from the

deposits of zinc-ore, and 24 of them are peculiar to the locality. Lists with the characteristic associations are given of (1) those in the primary ores; (2) pegmatite contact minerals, (*a*) skarns and re-crystallization products, (*b*) pneumatolytic products; (3) hydro-thermal vein minerals; (4) surface oxidation products. The ore consists of a granular mixture of franklinite (43 %), willemite (26), and calcite (25), with other silicates (5) and zincite (1 %). The primary minerals are franklinite, zincite, willemite, and tephroite. The author supposes that deposits of hydroxides and silicates of iron, manganese, and zinc, formed by the metasomatic replacement of limestone, were altered by pre-Cambrian regional metamorphism and that further alterations were produced by the later intrusions of pegmatites. L. J. S.

Pegau (A. A.). *The Rutherford mines, Amelia County, Virginia.* Amer. Min., 1928, vol. 13, pp. 583–588.

Of the many pegmatite veins in the vicinity of Amelia Court House two of them show a different texture and composition, due to the felspars being largely replaced by albite. It is on these two veins that the Rutherford mines (formerly worked for mica) are situated, and here that the several rare minerals for which the locality is noted were found. A list is given of 33 minerals recorded from these mines. L. J. S.

Megathlin (G. R.). *Spodumene and autunite from Alstead, New Hampshire.* Amer. Min., 1928, vol. 13, pp. 578–579.

Large crystals, 'several feet in length', of spodumene and small scales of autunite are recorded from the pegmatite quarried at Alstead in Chester County. L. J. S.

Foshag (William F.). *Mineralogy and geology of Cerro Mercado, Durango, Mexico.* Proc. U.S. Nat. Mus., 1929, vol. 74 (for 1928), art. 23, 27 pp., 4 pls., 3 text-figs.

The ore consists almost entirely of martite, with small amounts of goethite, apatite, &c. It forms flat-lying tabular bodies in latite, tuff, and rhyolite. The wall-rock shows an alteration of the latite to a pyroxene-rock and the rhyolite is silicified. Various theories as to the origin of the deposit are discussed: the replacement of the rocks by iron-bearing solutions appears to be the most likely. The apatite is of two types: large yellow crystals with ω 1·633, ϵ 1·630,

and colourless needles with ω 1·629, ϵ 1·626. Minute crystals of dahllite with optically biaxial sectors have ω 1·626, ϵ 1·609.

L. J. S.

Rebaudi (Ovidio). *Apuntes sobre minería Paraguaya.* Asuncion, 1924, 46 pp.

This sketch of the mineral resources of Paraguay was presented at the third Scientific Pan-American Congress held in Lima in December 1924. Mention is made of stibnite, bismuthinite, cassiterite, erythrite, lazulite, Iceland-spar, pyrolusite, &c., and chemical analyses are given of clays, iron ores, manganese ore, and marbles. Rocks are mentioned in a list of localities. There was some production of iron, sulphur, and nitre during the war in 1867. L. J. S.

Codazzi (Ricardo Lleras). *Sur quelques minéraux de Colombie.* Bull. Soc. Franç. Min., 1927, vol. 50. pp. 481–485.

A brief general account of the distribution of rocks and minerals in Colombia [M.A. **3**–544]. L. J. S.

Orcel (J.) & Plaza (Gil Rivera). *Etude microscopique de quelques minerais métalliques du Pérou.* Bull. Soc. Franç. Min., 1928, vol. 51, pp. 213–246, 13 pls., 2 text-figs. (maps).

A detailed study of polished sections [M.A. **3**–400] of ores from several mining districts in Peru. F. A. B.

Simpson (Edward S.). *Famous mineral localities: Wodgina, northwest Australia.* Amer. Min., 1928, vol. 13, pp. 457–468, 2 figs. [Explanation of figs., p. 594.]

A brief outline is given of the mineral occurrences in pegmatite veins, which have been worked for tin and tantalum ores, and in the less important quartz reefs, which carry gold and copper. A list with brief descriptions is given of 77 minerals that have been recorded in the author's several papers. Minerals described as new species from this district are pilbarite, hydrothorite, calciotantalite, and tanteuxenite. L. J. S.

Morgan (P. G.). *Minerals and mineral substances of New Zealand.* Bull. Geol. Survey New Zealand, 1927, n. ser., no. 32, [v]+110 pp., 2 maps. Price 5*s.* 6*d.*

A detailed alphabetical list of mineral-species, ores, and various economic minerals, with records of localities and references to the literature for each. L. J. S.

Miscellaneous.

Laemmlein (Georg). *Sekundäre Flüssigkeitseinschlüsse in Mineralien.* Zeits. Krist., 1929, vol. 71, pp. 237–256, 16 figs.

Primary inclusions in minerals are drops of the mother liquor or fragments of other substances enclosed during growth. Secondary liquid inclusions are derived from liquids forced into the mineral along cracks subsequently healed by dendritic crystalline growth. Such secondary inclusions were obtained artificially in rock-salt, saltpetre, and alum, while they were seen in fluorspar, beryl, quartz, and some twenty-three other minerals. H. H.

Arnold (W.). *Beiträge zur Kenntnis des Brookit in morphologischer und optischer Hinsicht.* Zeits. Krist., 1929, vol. 71, pp. 344–405, 35 figs.

Crystals of brookite were investigated, mainly from Maderanerthal in Switzerland. Fifteen forms, including new (5.14.4) [$a : b : c : = 0{\cdot}8416 : 1 : 0{\cdot}9444$] are noted. Three types of habit may be differentiated according to the relative development of the faces (001). These faces showed striations due to an oscillatory combination of (001) and (104); for the striations on the prism-zone are responsible a large number of vicinal faces. The numerous opaque inclusions were shown by X-ray experiments to be due to the mixture of niobium and iron with titanium dioxide. The optical properties are rather variable even in crystals similar in other ways. Tables are given of the absorption of light of various wave-lengths by the refraction and reflection of brookite crystals; and measurements were made of birefringence, &c. The crystals are uniaxial at about $\lambda = 555{\cdot}5\ \mu\mu$. H. H.

Nikitin (W. W.). *Parallele Verwachsungen des Fahlerzes und seine chemische Konstitution.* Zeits. Krist.. 1929, vol. 69, pp. 482–502, 1 fig.

A discussion of parallel growths of tetrahedrite and tennantite with chalcopyrite, &c. in relation to their crystalline structure and chemical constitution. H. H.

Rosický (V.). *Galenit-Durchkreuzungszwilling von Ratibořice in Böhmen.* Zeits. Krist., 1929, vol. 71, pp. 326–330, 2 figs.

A description is given of an interpenetration twin formed by two cubo-octahedra of galena, the cubic zone of one approximating

closely to the octahedral zone of the other. The twin-plane is (520) or (730), [(520) : ($7\bar{3}0$) = 45°]. H. H.

Braddock-Rogers (K.). *The action of air-carbon tetrachloride vapour mixtures on certain natural and artificial sulphides, selenides and a telluride.* Chem. News, London, 1929, vol. 138, pp. 147–152.

— *The action of air carbon tetrachloride vapour mixtures on several natural sulphides, sulpharsenites, and sulphantimonites.* Ibid., 1929, vol. 138, pp. 385–387.

For the decomposition of sulphides, selenides, tellurides, sulphantimonites, and sulpharsenites, a stream of air saturated with carbon tetrachloride vapour is heated to 750–800° C., and the resultant mixture containing chlorine, &c., passed over the heated mineral. The products of chlorination are absorbed by passage first through a hydrochloric acid-bromine wash-bottle and then through ammoniacal hydrogen peroxide. An apparatus is described and reaction temperatures and times for a variety of minerals given. Considerable advantages are claimed for the process over the use of chlorine gas. [No comparison is made with the well-known method employing air saturated with bromine vapour.] A method for the detection of sulphur compounds in carbon tetrachloride and a method for their removal are described. M. H. H.

Jander (Gerhart) & Faber (Hermann). *Über die Gewinnung hochwertiger Rubidiumpräparate aus Carnalliten.* Zeits. Anorg. Chem., 1929, vol. 179, pp. 321–331.

A new method is developed for the extraction of rubidium salts from carnallite, based on the low solubility of rubidium silicomolybdate. The carnallite solution is precipitated with a sodium silicomolybdate solution (the preparation of which is described), and the precipitate twice washed with hydrochloric acid, which dissolves out much of the potassium silicomolybdate, and decomposed at a dull red-heat in a current of hydochloric acid gas saturated with carbon tetrachloride vapour. Molybdenum oxychloride distils off, and the rubidium and potassium chlorides are extracted from the silica with hot water. After a second reprecipitation, a 98 % rubidium chloride is obtained in good yield. M. H. H.

Beger (P. J.). *Der Rückstand bei der Kieselsäurebestimmung.* Neues Jahrb. Min., Abt. A, 1928, vol. 57, pp. 237–248.

The residue from a silica determination in rock analysis, after the silica has been removed with hydrofluoric and sulphuric acids, con-

tains not only alumina, iron, chromium, phosphoric acid, titania, and zirconia, as is usually assumed, but also as much as 3% of the lime and magnesia of the rock. To recover the lime and magnesia, instead of igniting the iron and aluminium precipitate in the crucible with the residues, as is usual, the residues should be fused with a little pyrosulphate and the melt dissolved and added to the main solution before the precipitation with ammonia. M. H. H.

Eddy (C. E.), Laby (T. H.), & Turner (A. H.). *Analysis by X-ray spectroscopy.* Proc. Roy. Soc. London, Ser. A, 1929, vol. 124, pp. 249–268, 1 pl., 4 text-figs.

By suitable precaution the authors can detect three parts in a million of an impurity present in a target of the material under examination. The sensitivity of this method is greater than that of optical spectroscopy; this advantage is counterbalanced in the case of elements of low atomic number by the necessity of a vacuum spectrometer. It is found that X-ray methods lead to quantitative estimates of the impurities present. F. A. B.

Löwe (F.). *Über Spektralanalyse von Mineralien.* Neues Jahrb. Min., Abt. A, 1927, vol. 55, pp. 291–298, 1 pl., 2 text-figs.

A short review of the methods of spectrum analysis for the detection of minor constituents of minerals. M. H. H.

Philipsborn (H. v.). *Zur graphischen Behandlung quaternärer Systeme.* Neues Jahrb. Min., Abt. A, 1928, vol. 57, pp. 973–1012, 23 figs.

A very efficient method for the graphical treatment of four-component systems is described, based on a projection of a tetrahedron in parallel perspective perpendicular to one of its faces, a four-component space-point being represented by a vector in the final projection. The projection is easy to prepare, and lends itself to geometrical treatment and interpolation. Its use is illustrated by projections of some rock-series. The treatment of systems of more than four components is mentioned, and a useful bibliography of other methods for the projection of poly-component systems is given. [Cf. M.A. **4**–84.] M. H. H.

Barthoux (J.). *Calcite et nouveaux types de célestite du Moquattam (Egypte).* Bull. Soc. Franç. Min., 1925, vol. 48, pp. 219–224, 3 figs.

Cavities in the limestone contain large crystals of calcite twinned on $c(0001)$; the forms met with are noted. Pseudomorphs of celestine after gypsum are also described. F. A. B.

Barthoux (J.). *Un groupement d'apatite et de rutile.* Bull. Soc. Franç. Min., 1925, vol. 48, pp. 225–226.

Mugearites from the Arabian desert are rich in small apatite crystals which owe their grey colour to rutile inclusions. The rutile needles are oriented parallel to the axis; in a transverse section they are arranged parallel to alternate prism-edges. F. A. B.

Chermette (A.). *Notes cristallographiques sur la fluorine du Mont de Vannes, en Mélisey (Haute-Saône).* Bull. Soc. Franç. Min., 1926, vol. 48 (for 1925), pp. 269–272.

The simple cubic form of fluorite from this locality already described by H. Ungemach (1906) is also found to be accompanied by the rhombic-dodecahedral form. The evidence exists in negative crystals in adjacent layers of chalcedony. The author also describes rhombic-dodecahedra and octahedra with siliceous coatings, the silica being deposited in definite crystallographic direction on the faces. F. A. B.

Duffour (A.). *Sur les formes anormales du quartz et sur la formation de pseudo-faces planes non réticulaires.* Bull. Soc. Franç. Min., 1926, vol. 48 (for 1925), pp. 240–246, 2 figs.

Crystals of quartz from Arnaud-Guilhem (Haute-Garonne) show small faces truncating the edges of the $(01\bar{1}1)$ faces. Measurements show that these faces approximate to the forms $(30\bar{3}1)$ and $(9.1.\bar{1}0.9)$, but even assuming twinning the distribution of these faces is anomalous. The author names them pseudo-faces and supposes their origin similar to that of figures of growth. F. A. B.

Tschernick (G.) [= Chernik (G. P.)]. *Recherches sur la composition chimique de deux minéraux de Madagascar, l'ampangabéite et la columbite.* Bull. Soc. Franç. Min., 1926, vol. 49, pp. 127–135.

Analyses of these two minerals gave: Ampangabeite, *d* 4·45, Nb_2O_5 50·78, Ta_2O_5 1·80, TiO_2 5·22, SnO_2 0·27, ThO_2 1·65, UO_2 11·98, Yt_2O_3 &c. 4·71, Ce_2O_3 &c. 0·67, Fe_2O_3 10·03, CaO 0·87, H_2O 11·04 = 99·02. Columbite, *d* 5·378, Nb_2O_5 62·71, Ta_2O_5 12·42, SiO_2 0·65, TiO_2 1·30, SnO_2 0·41, U_3O_8 2·28, FeO 11·02, MnO 8·24, Al_2O_3 0·11, CaO traces, $K_2O + Na_2O$ 0·09, ignition 0·15 = 99·38. F. A. B.

Tschernik (Georges) [= Chernik (G. P.)]. *Sur la composition chimique d'une betafite de Sludianka.* Bull. Soc. Franç. Min., 1927, vol. 50, pp. 485–489.

A vein of aplite traversing limestone near Slyudianka, Lake Baikal, contains small black octahedra, density 4·82–4·93, whose composition

approximates to that of the Madagascar betafite. Nb_2O_5 37·36, Ta_2O_5 1·46, TiO_2 16·51, SiO_2 0·59, ThO_2 1·30, SnO_2 0·37, UO_3 26·37, Ce_2O_3 &c. 1·61, Yt_2O_3 &c. 3·11, Al_2O_3 0·24, Fe_2O_3 2·25, FeO 1·20, MnO 0·15, PbO 0·10, CaO 3·93, MgO 0·13, H_2O 2·47 = 99·15.

F. A. B.

Rosický (V.). *Sur la phénacite de San Miguel di Piracicaba, Minas Geraes (Brésil).* Bull. Soc. Franç. Min., 1927, vol. 50, pp. 47–55, 1 fig.

Previous work on the crystallography of phenakite from this locality is discussed. Measurement of two large crystals showed fifteen forms, one of which, ψ $(\bar{3}7\bar{4}5)$, is new $[a : c = 1 : 0{\cdot}6611]$.

F. A. B.

Longchambon (H.) & Mourgues (F.). *Sur le gisement de magnésite de Salinelles (Gard).* Bull. Soc. Franç. Min., 1927, vol. 50, pp. 66–74.

Meerschaum occurs at this locality as beds in lacustrine limestones of Eocene and Oligocene age. Analysis gave SiO_2 49·30, $Al_2O_3 + Fe_2O_3$ 1·95, MgO 18·20, CaO 5·15, CO_2 4·10, organic matter and water 20·50 = 99·20. The nature of the deposits suggests precipitation from colloidal solution by incoming brine. The excess of silica in these deposits mixed with limestone is probably due to decomposition by carbonic acid. F. A. B.

Thiébaut (L.). *Sur une magnétite titanifère des Antilles.* Bull. Soc. Franç. Min., 1928, vol. 51, pp. 160–161.

A thin section of this mineral shows nuclei of a highly refractive substance surrounded by the opaque magnetite. Alteration of titaniferous magnetite has in this case produced anatase. F. A. B.

Mélon (J.). *La chalcanthite du Katanga.* Bull. Soc. Franç. Min., 1928, vol. 51, pp. 194–196, 1 fig.

Clear, blue needles of a mineral from Luishia, Katanga, are shown chemically and optically to be chalcanthite. Analysis gave CuO 31·40, SO_3 32·13, H_2O 35·90, Fe_2O_3 0·76 = 100·19. F. A. B.

Gaubert (Paul). *Sur un cristal de pyrite, maclé suivant la loi des spinelles.* Bull. Soc. Franç. Min., 1928, vol. 51, pp. 211–212, 1 pl.

A large ($58 \times 46 \times 23$ mm.) cubo-octahedron of pyrite twinned according to the spinel-law is described from alluvial deposits in the French region of the Moroccan Rif. F. A. B.

Lacroix (A.). *Sur un nouveau type alumineux de pagodite.* Bull. Soc. Franç. Min., 1928, vol. 51, pp. 342–345.

Pagodite from Siao-wan-wan-keou in the Wei-chang district, north China, has the composition SiO_2 44·18, Al_2O_3 39·40, Fe_2O_3 0·41, FeO 0·15, CaO 0·82, Na_2O 0·09, K_2O 0·38, TiO_2 0·59, H_2O+ 14·21, H_2O- 0·19, MnO trace = 100·42; and another sample from Phnom Trasey, Cambodia, has the composition SiO_2 44·48, Al_2O_3 39·54, Fe_2O_3 0·40, FeO 0·20, CaO 0·58, Na_2O 0·04, K_2O 0·28, TiO_2 0·48, H_2O+ 14·22, H_2O- 0·25, MnO, trace = 100·47. These analyses, together with the physical data (n 1·54, d 2·608 for the Wei-chang material), show that the mineral is kaolinite, whereas pagodites are commonly found to have the composition of pyrophyllite. Both these minerals as they occur in China are transformation products of rhyolites. F, A. B.

Cesàro (G.). *Sur l'apatite, la fluorine, la cuspidine, et d'autres mineraux du Somma et du Vesuve.* Mém. (in–4°) Acad. Roy. Belgique, Cl. Sci., 1928, ser. 2, vol. 9, fasc. 4, 140 pp., 7 plates, 34 text-figs.

A detailed description of a large number of Vesuvian specimens together with many crystallographic and optical observations.

F. A. B.

Ungemach (H.). *Précisions cristallographiques sur quelques minéraux du Congo Belge.* Ann. Soc. Géol. Belgique, Publ. Congo Belge, 1929, vol. 52 (for 1928–9), pp. c 75–c 85, 3 figs.

Becquerelite gave $a:b:c = 0{\cdot}5591:1:0{\cdot}6056$ [cf. M.A. **2**–383]; seventeen new forms are noted. For schoepite the a-axis is doubled and new measurements gave $a:b:c = 0{\cdot}8524:1:0{\cdot}8744$ [M.A. **3**–60]; twelve new forms are noted. For cornetite the c-axis is doubled, $a:b:c = 0{\cdot}99045:1:1{\cdot}5282$ [cf. Min. Mag., **19**–228; M.A. **3**–552]; new forms are (001), (010), (102), (021), (113), and (114). L. J. S.

Tokody (L.). *Über das gediegene Tellur von Facebaja.* Centr. Min., Abt. A, 1929, pp. 114–120.

Some account is given of the early literature on the occurrence of native tellurium at Faczebaja near Zalatna in Transylvania. Measurement of ten crystals showed the forms $m\,r\,r_1$ and new $(20\bar{2}1)$, $(50\bar{5}4)$, $(07\bar{7}5)$, $(0{\cdot}3.\bar{3}.11)$. The axial ratio $a:c = 1:1{\cdot}3298$ of G. Rose (1849) is accepted. L. J. S.

Zedlitz (O.). *Trachtstudien an Kupferlasurkristallen verschiedener Paragenesen der Tsumebmine, Südwestafrika.* Zeits. Krist., 1929, vol. 71, pp. 1–44, 34 figs.

A crystallographic study of chessylite collected by H. Schneiderhöhn in 1914–19 at Tsumeb, South-West Africa. Crystals associated with different minerals show a difference in habit, and five such parageneses are distinguished: (1) olivenite, (2) mottramite, (3) siskin-green arsenate (hydrated Cu-Pb-Zn arsenates), (4) grass-green arsenate ($6CuO.2\ ZnO.2As_2O_5.H_2O$), (5) anglesite-cerussite. The persistency and 'central distance' of the various faces are tabulated for each habit. 53 forms are noted of which Σ: (232) is new [$a : b : c = 0{\cdot}8565 : 1 : 0{\cdot}8844$, $\beta = 87° 35'$, M.A. **3**–359]. L. J. S.

Bïäsch (H.). *Morphologische Untersuchung am Hämatit, unter besonderer Berücksichtigung des Vorkommens vom Piz Cavradi (Tavetsch).* Zeits. Krist., 1929, vol. 70, pp. 1–159, 2 pls., 48 text-figs. Separates as Promotionsarbeit, no. 514, Zürich, 1929.

A detailed description is given of the 54 forms (several of which are new) and their combinations found on 122 specimens of haematite from Cavradi, Switzerland; and these forms are compared with those obtained on crystals from other localities. H. H.

Papish (Jacob). *New occurrences of germanium. II. The occurrence of germanium in silicate minerals.* Econ. Geol., 1929, vol. 24, pp. 470–480. [Cf. M.A. **4**–88, 141.]

Several species of silicate minerals were examined spectrographically for germanium (lines 3039·1, 2651·6, 2651·1 Å.). Except in some specimens of topaz, lepidolite, tourmaline, and spodumene, the germanium content was found to be very low. For example, thirty-one specimens of topaz from various localities all showed traces, and topaz from Silver Leaf mine, Manitoba, yielded on quantitative separation about 0·001 % GeO_2. Of the forty-five felspars examined, most of them showed traces of germanium, the alkali-felspars being the richer. L. J. S.

Free (Oliver). *Investigation of the zirconium in Colorado pitchblende.* Phil. Mag., 1926, ser. 7, vol. 1, pp. 950–960.

Approximate analysis of a crude sample of pitchblende from Gilpin County gave: U_3O_8 78·9, FeS_2 6·7, SiO_2 5·9, ZrO_2 5·25, Pb, Ti, V 0·2, H_2O 1·75, residue 1·2 = 99·9. The low Pb : U ratio indicates an age of only two million years. The zirconia isolated

has low density, indicating that very little hafnium is present; spectroscopically it showed some scandium. L. J. S.

Nag (N. C.). *Chemical and electroscopic examination of a sample of radio-active columbite from Gaya district.* Quart. Journ. Geol. Mining Metall. Soc. India, 1929, vol. 2, pp. 1–6.

Columbite from this locality [M.A. **1**–173] gave on analysis: Nb_2O_5 59·05, Ta_2O_5 19·85, Fe_2O_3 0·22, FeO 7·90, MnO 11·62, CuO 0·15, U_3O_8 0·80, moisture 0·24, SiO_2, Pb, Bi traces = 99·83; sp. gr. 5·46. Comparison with standard pitchblende by the electroscopic method showed U_3O_8 0·81 %. Fragments showing specks of uranium-ochre gave higher uranium content (1·7 %). L. J. S.

Wilson (Eldred D.). *An occurrence of dumortierite near Quartzsite, Arizona.* Amer. Min., 1929, vol. 14, pp. 373–381, 4 figs.

The well-known dumortierite from Clip, Arizona, was found only as detrital boulders. The mineral has now been found in situ forty-five miles NNE. from Clip in Yuma Co. Pre-Cambrian schists are in part dumortierized and show the following sequence of deposition of the principal minerals: vein quartz; kyanite and andalusite; fibrolite; rutile and iron-ores; dumortierite; lastly quartz and pyrophyllite. Dumortierite, kyanite, andalusite, and fibrolite occur in intimate association, and they are in part altered to pyrophyllite, rather than to muscovite. The dumortierite occurs as dark violet-blue fibres and small prisms, both disseminated and in veinlets. It shows very strong but variable pleochroism: α deep blue, β colourless to yellow, γ colourless to pale blue. L. J. S.

Gottfried (C.). *Die Mineralien der Adamellogruppe. I. Teil. Spinell aus der Gegend des Lago del Campo.* Verh. Geol. Bundesanstalt, Wien, 1928, pp. 182–184.

Small black octahedra of spinel occur with diopside and plagioclase embedded in dolomitic marble at this locality in Trentino. In thin splinters the material is green and translucent. Sp. gr. 3·623, n 1·727. Analysis by Miss Bendig gave SiO_2 0·91, TiO_2 0·14, Al_2O_3 67·84, Fe_2O_3 4·12, FeO nil, MnO 0·07, ZnO 1·62, MgO 25·19, Na_2O 0·22 = 100·11, corresponding with $MgAl_2O_4$ 85·91, $ZnAl_2O_4$ 3·66, $MgFe_2O_4$ 5·20 %. The presence of zinc and sodium [cf. M.A. **2**–185] is noteworthy. L. J. S.